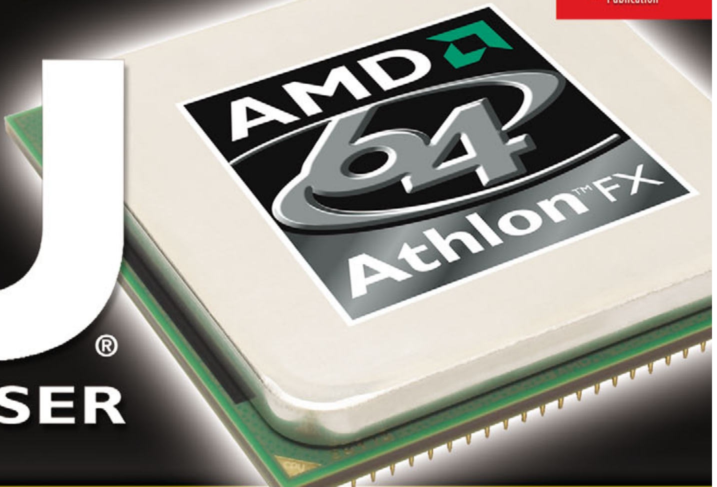
Seagate Barracuda 7200.10 750GB | Gigabyte i-RAM | Sapphire Radeon X1900 GT | Foxconn C51XEM2AA

A Sandhills Publication

CPU®
COMPUTER POWER USER



Chronic Enablers:
Intel Motherboard Roundup
(page 19)

Boot Manager Cage Match:
Score One For The Little Guy
(page 74)

Two From AMD:
FX-62 & X2 5000+
(page 30 & 31)

Check Out
The Hawg
On Page 44

Build Your Own RAID Array

Installation,
Compatibility,
Troubleshooting
& More

page 54

July 2006 • Vol. 6 Iss. 07
$5.99 U.S. • $7.99 Canada

Q&A With
Rick Rashid
Microsoft Research Boss
Weighs In On The
Future Role Of The PC
(page 108)

MonarchComputer.com™

"We Have What You're Looking For!"

Buy Online or by phone: 1-800-611-0875

Paypal - Visa - Mastercard
Discover - AMEX

Take the Monarch Challenge:

Give us 5 minutes and SAVE $100s if not $1000s!
Create & Save Quick Quotes!
Lock-in pricing for up to 7 days!

AMD
Solution Provider
PLATINUM

AMD Athlon™ 64 FX & X2 (Socket AM2) Combos

FREE SETUP and TESTING on ALL COMBOS!

AMD 64 Athlon FX
AMD 64 Athlon X2

Gigabyte GA-M51GM-S2G GeForce6100 Audio/GB-LAN/PCI-E/IEEE1394 SATA3G/DDR2 AMD Athlon™ 64 X2 processor 3800+ (Socket AM2)	MSI K9N Neo-F Audio/GB-LAN/PCI-E USB/IEEE-1394/SATA3G/DDR2 AMD Athlon™ 64 X2 processor 4400+ (Socket AM2)	MSI K9N Platinum Audio/GB-LAN/PCI-E/USB IEEE-1394/SATA3G/DDR2 AMD Athlon™ 64 X2 processor 5000+ (Socket AM2)	Asus M2N32-SLI Deluxe nForce4 SLI Audio GB-LAN/IEEE-1394a PCI-E/SATA3G/DDR2 AMD Athlon™ 64 FX-62
Only $425	Only $609	Only $375	Only $1289

AMD Athlon™ 64 FX - New levels of performance – play the latest 3D games at jaw-dropping speed.

AMD Opteron™ (939) Combos

All Combos have a 15 day standard Monarch warranty
(90 day, 6 mo., 1, 2 and 3 year Monarch warranty options available)

AMD 64 Opteron

Asus A8R32-MVP Deluxe CrossFire Audio/GB-LAN/IEEE-1394a PCI-E/SATA3G/DDR AMD Opteron™ processor 146 (939)	DFI NF4 SLI Infinity Audio/GB-LAN/IEEE-1394 PCI-E/SATA3G/DDR AMD Optreon™ processor 150 (939)	MSI K8N NEO4 Platinum Audio/GB-LAN/PCI-E/USB IEEE-1394/SATA/DDR AMD Opteron™ processor 165 (Dual Core 939)	Asus A8N32-SLI Deluxe nForce4 SLI Audio GB-LAN/IEEE-1394aPCI-E/SATA3G AMD Opteron™ processor 185 (Dual Core 939)
Only 319	Only $415	Only $429	Only $1239

AMD Opteron™ - High-performance workstation solutions for today's demanding enterprise applications with room to grow

AMD Athlon™ 64 & X2 (939) Combos

All Monarch Combos Include cables, manuals and drivers
All Monarch Combos usually ship in only 2-4 business days!

AMD 64 Athlon X2
AMD 64 Athlon

Asus A8V-E SE VIA K8T890/VT8237R Audio/GB-LAN/PCI-E/SATA AMD Athlon™ 64 processor 4000+ (939)	DFI NF4 Infinity nForce4 Audio/GB-LAN/IEEE-1394 PCI-E/SATA AMD Athlon™ 64 X2 processor 3800+ (Dual Core 939)	Gigabyte GA-K8N PRO-SLI NF4 SLI Audio/GB-LAN/PCI-E/USB IEEE-1394b/SATA AMD Athlon™ 64 X2 processor 4400+ (Dual Core 939)	Abit AN8-32X nForce4 Audio/GB-LAN/USB IEEE-1394/PCI-E/SATA3G AMD Athlon™ 64 X2 processor 4800+ (Dual Core 939)
Only $379	Only $379	Only $569	Only $799

The AMD Athlon™ X2 dual-core processor enables everyone to do more in less time by delivering exceptional multi-tasking capabilities and increased performance on digital media.

nero
7 ULTRA EDITION
with an upgrade to AMD Athlon™ 64!

FREE! FREE! FREE!

Get Nero 7 Ultra Edition, a LIVESTRONG™ Wristband, and a FREE GIFT when you upgrade to any AMD 939 or AMD Socket AM2 Combo, Barebone or System!

LIMITED TIME BONUS - AGE of EMPIRES 3 FREE with Select Configurations! ONLY WHILE SUPPLIES LAST! See website for Details.

ENTER TO WIN 1 of 8 AUTOGRAPHED LANCE ARMSTRONG JERSEYS!*

Purchase any AMD Athlon™ 64/FX/X2/Opteron 100 (939) bundle or Socket AM2 bundle from Monarch and get Nero 7 Ultra, choice of FREE GIFT and a LIVESTRONG™ wristband for helping Monarch support the battle against cancer. Monarch Computer and you can make a difference.

ONLY MONARCH CAN DELIVER ALL THIS WITH YOUR UPGRADE! Get OVER $100 in FREE SOFTWARE, GIFTS and MORE - With any of these Combos, Barebones, or Systems!

Educational and Government POs Welcome.

GSA Schedule
Contract GS-35F-0202P

Commercial leasing available for purchases as low as $1000.

Prices subject to change without notice. Monarch Computer not responsible for typographical errors.

We ship to the Continental U.S., Alaska, Hawaii, APOs, Puerto Rico, and Canada

AMD, the AMD Arrow logo, AMD Athlon, and combinations thereof, are trademarks of Advanced Micro Devices, Inc. All brands and product names are trademarks or registered trademarks of their respective companies. AMD model numbers indicate relative software performance among this AMD processor family. *Enhanced Virus Protection (EVP) is only enabled by certain operating systems including the current versions of Microsoft® Windows®, Linux, Solaris, and BSD Unix. After properly installing the appropriate operating system release, users must enable the protection of their applications and associated files from buffer overrun attacks. Consult your OS documentation for information on enabling EVP. Contact your application software vendor for information regarding use of the application in conjunction with EVP. AMD and its partners strongly recommend that users continue to use a third party anti-virus software as part of their security strategy.

AMD Sempron™, Athlon™ 64/FX/X2, Opteron 100 Series (939 pinand Socket AM2) Barebones

AMD Sempron™ - Redefining everyday computing. AMD Athlon™ 64 Processors feature AMD 64 Technology, Cool'n'Quiet™ Technology, HyperTransport™ Technology & Enhanced Virus Protection for the Microsoft® Windows® XP- SP2

SOCKET AM2

Enermax CA-3030-BS Midtower
w/400W PS
Gigabyte GA-M51GM-S2G Motherboard
AMD Sempron™ Processor 3000+
(Socket AM2)
Starting @ **$339**

Antec Performance TX1050B SOHO
w/500W PS
MSI K9N Platinum Motherboard
AMD Athlon™ 64 X2 processor 4400+
(Socket AM2)
Starting @ **$849**

Antec Sonata II Midtower
w/450W PS
DFI NF4 Infinity nForce4
AMD Athlon™ 64 processor 3800+
(Socket AM2)
Starting @ **$559**

Lian-Li V COOL PC-V1000 Plus
w/535W SLI PS
Asus M2N32-SLI Deluxe nForce4 SLI
AMD Athlon™ 64 FX-62processor
(Socket AM2)
Starting @ **$1685**

Mini Mid ATX USB Case
w/300W PS
Asus A8N-VM nForce410
AMD Athlon™ 64 processor 3200+
(939 pin)
Starting @ **$339**

Antec Performance TX1050B SOHO
w/500W PS
Gigabyte GA-K8NSC-939 Motherboard
AMD Athlon™ 64 X2 processor 3800+
(939 pin)
Starting @ **$515**

Antec SLK1650B ATX 2.0 Mid Tower
w/350W PS
DFI NF4 Infinity nForce4
AMD Athlon™ 64 processor 4000+
(939 pin)
Starting @ **$475**

Asus VENTO Red 3600 TA360
w/535W SLI PS
DFI Lan Party UT nForce4 SLI-DR
AMD Athlon™ 64 X2 processor 4400+
(939 pin)
Starting @ **$1869**

Lian-Li PC-60B Plus
w/550W SLI PS
Asus A8N-SLI NForce4 SLI
AMD Opteron™ processor 146
(939 pin)
Starting @ **$529**

Thermaltake Shark VA7000SWA
w/620W PS
Asus A8N-SLI Premium nForce4 SLI
AMD Opteron™ processor 165
(939 pin)
Starting @ **$825**

Sunbeamtech Transformer ATX Mid-Tower
w/520W PS
MSI K8N SLI-F Motherboard
AMD Opteron™ processor 152
(939 pin)
Starting @ **$815**

Cooler Master CM Stacker RC-830-SSN1
w/650W SLI PS
DFI LANPARTY UT CFX3200-DR CrossFire
AMD Opteron™ processor 185
(939 pin)_
Starting @ **$1695**

Monarch Barebones include: case, motherboard, CPU w/fan, and Set-up and testing by AMD Certified Technicians - All for only $45.00! - Usually ships in ONLY 4-7 business days!

Lowest Prices on AMD CPUs!

AMD Athlon™ 64 Socket AM2 Retail Box CPUs

AMD Athlon™ 64 3500+	$203.00
AMD Athlon™ 64 3800+	$284.00

AMD Athlon™ 64 X2* Socket AM2 Retail CPUs

AMD Athlon™ 64 X2 3800+	$297.00
AMD Athlon™ 64 X2 4000+	$321.00
AMD Athlon™ 64 X2 4200+	$357.00
AMD Athlon™ 64 X2 4400+	$460.00
AMD Athlon™ 64 X2 4600+	$547.00
AMD Athlon™ 64 X2 4800+	$632.00
AMD Athlon™ 64 X2 5000+	$682.00
AMD Athlon™ 64 FX-62	$1011.00

AMD Opteron™ Dual Core OEM CPUs (939 pin)

AMD Opteron™ 165 1.8GHz	$331.00
AMD Opteron™ 170 2.0GHz	$402.00
AMD Opteron™ 175 2.2GHz	$514.00
AMD Opteron™ 180 2.4GHz	$707.00
AMD Opteron™ 185 2.6GHz	$1134.00

AMD Opteron™ OEM CPUs (939 pin)

AMD Opteron™ 146 2.0GHz	$213.00
AMD Opteron™ 148 2.2GHz	$261.00
AMD Opteron™ 150 2.4GHz	$331.00
AMD Opteron™ 152 2.6GHz	$716.00
AMD Opteron™ 154 2.8GHz	$910.00

Components and Upgrades

150353
Western Digital
Raptor X 150 GB
16 MB Cache SATA 10K
(WD1500AHFD) - Clear Cover
$299.89

150945
Seagate Barracuda
(ST3750640AS)
750 GB 7200 RPM
16MB Cache SATA3G
$520.00

100379
Cooler Master CM Stacker 810
RC-810-SKN1 E-ATX
Full-Tower, No PS (Black)
$139.97

100335
Cooler Master
Praetorian 730 Aluminum
Mid-Tower Case w/No PS
(RC-730) (Black)
$139.00

190025
EVGA Geforce
7900 GT KO 256MB
GDDR3/PCI-E/HDTV-Out
Dual-DVI-DL
(Retail Box)
$599.00

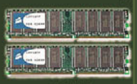
190878
ATI (HIS) Radeon X1900 XT
IceQ3 512MB GDDR3
PCI-E/AVIVO/Dual-DVI-DL
(Retail Box)
$469.69

**1000s of In-Stock Components!
FREE SHIPPING on 100s of items!**

CORSAIR

Monarch Systems feature Award-winning Corsair Memory

140121
1 GB (2 pcs 512)
DDR2 (533)
PC-4200 Corsair
(VS1GBKIT533D2)
$86.62



140122
2 GB (2 pcs 1GB)
DDR2 (533)
PC2-4200 Corsair
(VS2GBKIT533D2)
$159.62

Online price leader for Corsair modules!

**The AMD Athlon™ 64 X2 dual-core processor provides the same level of system features customers have grown to expect with the AMD Athlon™ 64 product family: HyperTransport™ technology - Enhanced Virus Protection for Microsoft® Windows® XP- SP2 - Cool'n'Quiet™ technology*

nero
7 ULTRA EDITION
with an upgrade to AMD Athlon™ 64!

ONLY MONARCH CAN DELIVER ALL THIS WITH YOUR UPGRADE!
Nero 7 Ultra Edition, Livestrong Wristband, Lance Armstrong Contest Entry
& FREE GIFTS! Along with the best parts, prices, service and support in the industry!

MonarchComputer.com™

GRAPHICS BY ATI

MONARCH IS PROUD TO FEATURE GRAPHICS BY ATI IN OUR FULL LINE OF ADVERSARY® GAMING DESKTOP SYSTEMS

Monarch Adversary® 2 Custom Gaming Desktop (PCI-E & Socket AM2)

Keyboard, monitor, and speakers available seperately - see website for all accessories.

Ask for Part #: 80962

AVAILABLE COMPONENTS:

Choice of Case and Power Supply
Choice of name-brand Motherboard
Choice of AMD Athlon™ 64/FX/X2 Socket AM2
- includes heatsink and fan
Choice of name-brand memory
Up to 3 name-brand Hard Drives,with
optional RAID setup (1 or 0)
Up to 2 name-brand Optical Drives
from CD-ROM upto Dual-Layer DVD Writes
Choice of Floppy Drive
Choice of ATI PCI-E graphics card
Choice of name-brand sound card
Network options from modem to wireless
Choice of OS including Microsoft Windows
XP Home, Professional, and Media Center
Industry Standard Upgradable
Full line of peripherals and accessories
1 or 3 year warranties available
24/7 on-site service available

Dominate the competition with your dream rig!

Starting @ ONLY $439!

Monarch Adversary® 2 Value Gaming Special (PCI-E & Socket AM2)

Keyboard, monitor, and speakers available seperately - see website for all accessories.

Ask for Part #: 90662

SELECTED COMPONENTS:

Antec Sonata II Piano Black Quiet Mid Tower
w/450W Power Supply
Gigabyte GA-M51GM-S2G Motherboard
AMD Athlon™ 64 3500+ (Socket AM2)
- includes AMD Certified heatsink
1 GB (2 pcs 512) DDR2 (533) PC2-4200
- Patriot Signature (PSD21G533K)
Western Digital Caviar SE 160 GB SATA3G
8MB Cache 7200 RPM (WD1600JS)
NEC ND-3550A 16X Dual Layer DVD±RW
ATI (Connect3D) Radeon X1600 XT
256MB GDDR3/PCI-E/TV-Out/DVI-DL
Optional choice of Microsoft Windows OS
Industry Standard Upgradable
USB Ports on front of case
1 or 3 year warranties available
24/7 on-site service available

ONLY $845!

CrossFire™ - Multi-GPU:

Multiply & Conquer
CrossFire ignites an entirely new gaming experience by accelerating all your games, all the time, with the power of multiple GPUs within a single PC.

Unite and Dominate
Combined Multi-GPU power that soars into a new dimension of graphics capability

Divide and Conquer
High-performance GPU sharing that accelerates all games, all the time.

Render and Rule
The highest image quality and screen resolutions even with the most demanding 3D titles.

Now and Future
Keep ahead of fast-moving gaming effects and technology changes with CrossFire's advanced features.

CROSS FIRE
MULTI-GPU READY

ATI RADEON X1900 CROSSFIRE EDITION

Visual Velocity is Speed, Performance and Sharp Image Quality

Prepare for the future of games with the Radeon® X1900—the fastest consumer 3D graphics processor on the planet. With its ultra-threaded engine and unparalleled shader performance, the Radeon X1900 delivers maximum graphical detail at excellent frame rates. Go beyond games with Avivo™ technology to watch stunning HD video and view digital photos in vibrant detail with over 1 billion colors.

Monarch Adversary™ Crossfire Edition Custom Desktop

Keyboard, monitor, and speakers available seperately - see website for all accessories.

Ask for Part #: 80777

AVAILABLE COMPONENTS:

Choice of Case and Power Supply
Choice of ATI CrossFire™ mainboard
Choice of AMD Athlon™ 64/FX/X2
- includes heatsink and fan
Choice of name-brand memory
Up to 3 name-brand Hard Drives,with
optional RAID setup (1 or 0)
Up to 2 name-brand Optical Drives
from CD-ROM upto Dual-Layer DVD Writes
Choice of Floppy Drive
ATI Radeon® X1900 CrossFire™ Card with
optional second card for dual GPU rendering
Choice of name-brand sound card
Network options from modem to wireless
Choice of OS including Microsoft Windows
XP Home, Professional, and Media Center
Industry Standard Upgradable
Full line of peripherals and accessories
1 or 3 year warranties available
24/7 on-site service available

Experience the power of ATI's Crossfire Technology and take your gaming to new heights!!

Starting @ ONLY $569!

HORNET PRO

> **"The Hornet is loaded with features, making this a solid all around PC, and as the gaming benchmarks will attest, a great gaming system."**
>
> *– Darren Polkowski,*
> *Graphics Editor at Tom's Hardware Guide*
> www.tomshardware.com

GRAPHICS BY ATI

Hornet Pro available with graphics by ATI

LINUX JOURNAL READERS' CHOICE
BEST PORTABLE WORKSTATION

MAXIMUM PC KICK ASS PRODUCT

CPU COMPUTER POWER USER

COMPUTER GAMES EDITOR'S CHOICE

Computer Games ★★★★★ Five of Five Stars

NEW CAMO VINYL WRAPS!

ALSO AVAILABLE IN 6 CUSTOM COLORS!

Selected Athlon™ 64/FX/X2/ Opteron 100 Barebones!

See website for complete selections available

Monarch Hornet Pro u-ATX (Black)
w/Enermax EG285SX-VB(W)SFMA Micro ATX
270W Power Supply
Gigabyte GA-K8N51GMF-9 nF4 MB
AMD Athlon™ 64 processor 3500+
Starting @ $479

Monarch Hornet Pro u-ATX (Silver)
w/Enermax EG285SX-VB(W)SFMA Micro ATX
270W Power Supply
MSI RS482M4-ILD ATI RS482
AMD Athlon™ 64 processor 3700+
Starting @ $639

Monarch Hornet Pro u-ATX (Silver)
w/Topower TOP350FX Micro ATX 350W PS
MSI RS482M4-ILD ATI RS482
AMD Opteron™ processor 165 (939 dual-core)
Starting @ $689

Monarch Hornet Pro u-ATX (Indigo)
w/Topower TOP350FX ATX 12V 350W PS
MSI RS482M4-ILD ATI RS482
AMD Athlon™ 64 FX-60 processor
Starting @ $1369

Also available as full custom systems!

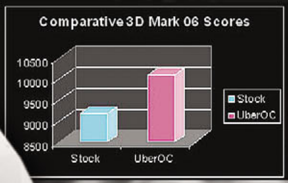
ONLY MONARCH CAN DELIVER ALL THIS WITH YOUR UPGRADE!
Nero 7 Ultra Edition, Livestrong Wristband, Lance Armstrong Contest Entry & FREE GIFTS! Along with the best parts, prices, service and support in the industry!

Introducing Uber O.C.™ by Monarch and EVGA®

Monarch Computer™ has announced, for the first time ever, their intent to add to their popular Nemesis™ and Hornet Pro® gaming systems two new systems built around a graphics processor hand-picked by EVGA® to provide the best possible overclocking potential. Monarch Computer currently offers several lines of gaming systems, many based around the high-end NVIDIA® 7900 GTX gaming GPU, however this is the first time that Monarch Computer will offer a system specifically with GPU overclocking in mind. For these graphics cards, dubbed UberOC, the engineering team at Monarch Computer worked closely with video card manufacturer EVGA to create the best balance of performance and reliability which will offer customers the fastest EVGA video card available.

"Monarch worked with EVGA to bring a uniquely overclocked version of its cards to gamers. The core of the "über clocked" cards is running at 700 MHz and the memory is set at 880 MHz (1760 MHz DDR). Of course, these cards are only available through Monarch. With Monarch gear you thus benefit from the company's custom-build know now and high-level supplier relationships."

– Darren Polkowski,
Graphics Editor at Tom's Hardware Guide
www.tomshardware.com



Available in these Custom Gaming PCs

Hornet Pro®
(AMD 939 or Socket AM2)

Nemesis™
(AMD 939)

Nemesis™ 2
(Socket AM2)

Visit www.uberoc.com for full details, specs, benchmarks and MORE...

Take the Monarch Challenge:

Give us 5 minutes and Save $100s if not $1000s!

Create & Save Quick Quotes! Lock-in pricing for up to 7 days!

MonarchComputer.com™

ONLY MONARCH CAN DELIVER ALL THIS WITH YOUR UPGRADE!
Nero 7 Ultra, Livestrong Wristband, Jersey Contest and choice of FREE GIFT - Along with the best parts, prices, service and support in the industry!

FREE GIFT!

CPU
COMPUTER POWER USER

July 2006 • Vol 6 Issue 07

RAID
The Ins, Outs & What Have Yous

Frontside

8 What's Happening
14 Digital Economy
15 **The Saint**
Monkeys Banging On Keyboards

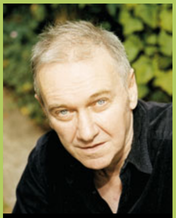
The Experts

Alex St. John
The Saint
page 15

Alex "Sharky" Ross
The Shark Tank
page 38

Anand Lal Shimpi
Anand's Corner
page 36

Rob "CmdrTaco" Malda
The Department Of Stuff
page 87



Mike Magee
Shavings From The Rumour Mill
page 102

Pete Loshin
Open Sauce
page 83

Chris Pirillo
Dialogue Box
page 82

Spotlight

54 **To RAID Or Not To RAID**
Is The Payoff Worth The Effort On The Desktop?

58 **RAID Workshop**
Four Array Types Built To Order

64 **Before You RAID**
Answers, Insights & Advice For Common Pitfalls

Copyright 2006 by Sandhills Publishing Company. *Computer Power User* is a trademark of Sandhills Publishing Company. All rights reserved. Reproduction of material appearing in *Computer Power User* is strictly prohibited without written permission. Printed in the U.S.A. GST # 123482788RT0001 (ISSN 1536-7568) *CPU Computer Power User* USPS 020-801 is published monthly for $29 per year by Sandhills Publishing Company, 131 West Grand Drive, P.O. Box 82667, Lincoln, NE 68501. Subscriber Services: (800) 424-7900. Periodicals postage paid at Lincoln, NE. POSTMASTER: Send address changes to *Computer Power User*, P.O. Box 82667, Lincoln, NE 68501.

Did you find the hidden *CPU* logo on our cover? Turn the page for the answer.

Page 27

Heavy Gear

18 **Dream Hardware**

19 **Intel's New 975X Arrives**
But How Does It Stack Up?

24 **Get Some (En)closure**
Drive Accessories
For Cooling & Accessibility

27 Seagate Barracuda 7200.10 750GB
Sapphire Radeon X1900 GT

28 Biohazard Annihilation Quad SLI Edition

29 **ATI Radeon X1900 XTX vs.**
Gigabyte GeForce 7900 GTX
A Single-Card Slugfest

30 AMD Athlon 64 FX-62

31 AMD Athlon 64 X2 5000+

32 Asus PW191
Asetek Waterchill Xternal

34 Gigabyte i-RAM
Asus EN7900GT TOP

35 Philips Brilliance 230WP7
Foxconn C51XEM2AA

36 **Anand's Corner**
AMD Introduces Socket AM2:
I'll Tell You Why

38 **The Shark Tank**
Physics 101

Page 28

Guild Wars Factions
Page 91

Hard Hat Area

PC Modder

39 **Tips & Tutorials**
40 **Enter The Matrix (Orbital)**
A Mod That Puts Your System
Data On Display
44 **Mad Reader Mod**
The HD-1: Born To Be Harley-Davidson

46 **Advanced Q&A Corner**
48 **X-Ray Vision: UEFI**
Make The BIOS Better
50 **White Paper: GeForce 7900**
Making Efficiency Stronger

Loading Zone

68 **The Bleeding Edge Of Software**
Inside The World Of Betas
69 **Up To Speed**
Upgrades That'll Keep You
Humming Along
70 **Twinsanity**
Do Hard-Core Users Really
Need Multiple Cores?
74 **The Art Of The Multiple-Boot**
The Name Of The Game Is "Management"
78 Handmark Pocket Express 3.0
Honest Technology Fireman 2.0
CD/DVD Burner
79 iWork '06
iLife '06
80 Lavalys Everest Ultimate Edition 2006
82 **Dialogue Box**
IAmFAT32
83 **Open Sauce**
Red Hat, Revisited

Caught In The Web

84 **When The Wiki Hits The Fan**
Can Truth Be Open Source?
87 **The Department Of Stuff**
eyecandy.txt

Digital Living

88 **Road Warrior**
First HD DVD Notebook Arrives,
OtterBox Strikes Again, Samsung's Very
Thin Phone & More
90 **At Your Leisure**
Games, Gear, Movies & Music
96 **The Cutting Edge**
When Did The First Massively
Multiplayer Online Environment Appear?

Tips & Tricks

98 **Software Tips & Projects**
Slipstreaming With All The Fixins (Part 1)
100 **Warm Up To Penguins**
Listening To MP3s In Linux

What's Cooking

102 **Shavings From The Rumour Mill**
PC Churn Means We All Will Upgrade
103 **Hot Seat**
Centrino: Intel's Israeli Savior
104 **Technically Speaking**
An Interview With Chris Crawford,
Author & Gaming Pioneer
106 **Under Development**
A Peek At What's Brewing
In The Laboratory

Back Door

108 **Q&A With Rick Rashid**
Microsoft Research Boss Weighs In
On The Future Role Of The PC

CORRECTIONS:

On page 7 of the June issue, we erroneously included a product blurb on the ThinkGeek.com Wireless Extension Cord, a "product" that was in fact an April Fools' Day gag and does not exist.

Infinite Loops

Strange stats and other oddball items from computing's periphery

86, 99, 101

EDITOR'S NOTE

Some of the really cool stuff we've been looking forward to in PC hardware this year is finally starting to arrive. As you've probably seen and heard, AMD's new socket AM2 platform is officially out now (check out our reviews of the FX-62 and the X2 5000+ in the Heavy Gear section), and Intel's Conroe CPUs will be here very soon, as well.

These launches are fun because they go beyond the clock speed bumps and the other incremental changes we get throughout the year; what we're seeing now are some pretty significant changes in fundamental CPU and/or chipset architectures. And even if the effects of some of these changes aren't fully apparent today, in many cases—such as AMD's move to DDR2—they are a foundation for far more dramatic things to come.

In the meantime, though, there are other things to consider, such as the pros and cons of a RAID config for your particular situation. RAID is one of those things that some folks do just for fun or to kick the tires a bit, while some take it far more seriously. Whatever your stance on RAID, you probably know that if you ask 10 people for an opinion on it, you'll likely get 10 dramatically different answers. This month we present a few of those viewpoints for those of you who may still be on the bubble about implementing RAID (or who just enjoy a good tech debate), as well as detailed setup descriptions for four RAID build types. We've even put together a few pages' worth of Q&A that will hopefully address some of your questions before you start a RAID project, helping you avoid common snags and making the process go more smoothly.

Elsewhere in the issue, check out our takes on three Intel-compatible motherboards (page 19), take a peek under the hood of UEFI (page 48), and see how five boot manager apps fared in our comparison (page 74). While you're here, make sure you check in with our columnists this month. (Especially The Saint on page 15, who's even crankier than usual.)

That's all I have for now, so enjoy, and drop us a line.

Chris Trumble, Publication Editor, *CPU*

Sandhills Publishing

Customer Service
(For questions about your subscription or to place an order or change an address.)
customer-service@cpumag.com
Toll Free: (800) 733-3809
Fax: (402) 479-2193
Computer Power User
P.O. Box 82667
Lincoln, NE 68501-2667

Hours
Mon. - Fri.: 7 a.m. to 8 p.m. (CST)
Sat.: 8 a.m. to 4 p.m. (CST)
Online Customer Service & Subscription Center
http://www.cpumag.com

Web Services
(For questions about our Web site.)
webhelp@cpumag.com
(800) 733-3809

Authorization For Reprints
Reprint Management Services
Toll Free: (800) 290-5460
(717) 399-1900 ext. 100
Fax: (717) 399-8900
ComputerPowerUser@reprintbuyer.com
www.reprintbuyer.com

Editorial Staff
editor@cpumag.com
Fax: (402) 479-2104
131 W. Grand Drive
Lincoln, NE 68521

Subscription Renewals
(800) 382-4552
Fax: (402) 479-2193
http://www.cpumag.com

Advertising Staff
Toll Free: (800) 848-1478
Fax: (402) 479-2193
120 W. Harvest Dr.
Lincoln, NE 68521

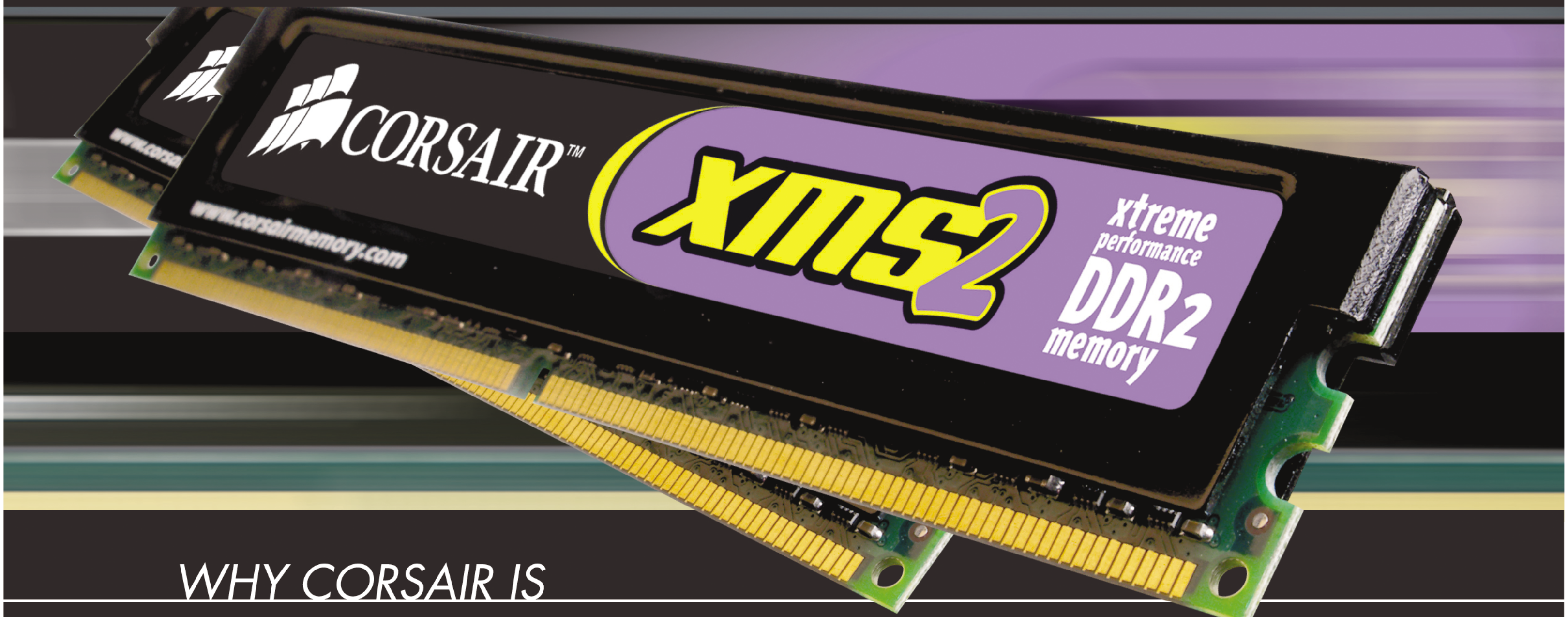
The Gang
Editorial Staff: Ronald D. Kobler / Christopher Trumble / Blaine Flamig / Trista Kunce / Corey Russman / Rod Scher / Calvin Clinchard / Katie Sommer / Kimberly Fitzke / Katie Dolan / Raejean Brooks / Sally Curran / Michael Sweet / Nate Hoppe / Sheila Allen / Joy Martin / Linne Ourada / Ashley Finter / Holly Zach / Tara Simmons / Barbara Ball / Marty Sems / Chad Denton / Nathan Chandler / Kylee Dickey / Josh Gulick / Andrew Leibman / Vince Cogley / Sam Evans / Jennifer Johnson **Web Staff:** Dorene Krausnick / Laura Curry / Kristen Miller **Customer Service:** Lindsay Albers **Subscription Renewals:** Connie Beatty / Matt Bolling / Patrick Kean / Charmaine Vondra / Miden Ebert / Kathy DeCoito / Stephanie Contreras / Nicole Buckendahl **Art & Design:** Lesa Call / Aaron D. Clark / Fred Schneider / Aaron Weston / Carrie Benes / Ginger Falldorf / Sonja Warner / Lori Garris / Jason Codr / Andria Schultz / Erin Rodriguez / Lindsay Anker **Newsstand:** Garth Lienemann / Jeff Schnittker **Advertising Sales:** Grant Ossenkop / Liz Kohout / Cindy Pieper / Brooke Wolzen / Eric Cobb / Ryan Donohue **Marketing:** Mark Peery / Marcy Gunn / Kelly Richardson / Travis Brock / Jen Clausen / Scot Banks / Ashley Hannant / Luke Vavricek / Becky Rezabek / Lana Matic / Jeff Ashelford / Brynn Burtwistle

Gotcha.
Here it is.

INNOVATION | PERFORMANCE | RELIABILITY

CORSAIR™

Performance



WHY CORSAIR IS THE CHOICE OF ENTHUSIASTS WORLDWIDE

FIRST PRODUCTION MEMORY TO HIT 1066MHZ

Take the latest AMD and Intel motherboards to the limit with Corsair's highest performance 2GB memory yet. Our latest SLI-Ready memory unleashes system performance at an incredible 1066MHz, bringing a new competitive edge to serious gamers and enthusiasts.

Featuring Enhanced Performance Profiles (EPP)

Working together, industry leaders Corsair and NVIDIA have rethought and enhanced the JEDEC Serial Presence Detect (SPD) to simplify the overclocking process, while ensuring platform and component compatibility. The result: compatible motherboards can now read and take advantage of added performance capabilities and information. That brings turn-key ease to overclocking beginners and provides a solid base/recovery point, as well as unparalleled control, for expert overclockers.

The World's Most Awarded Memory

Corsair is consistently the most highly awarded memory in industry publications and review sites worldwide. Put Corsair innovation, performance and reliability to work for you. Choose from a wide variety of speed, latency, size and style options.
For more information visit www.corsairmemory.com.

ORDER FROM THESE OFFICIAL CORSAIR RETAILERS

BEST BUY
Fry's ELECTRONICS
MICRO CENTER The *Ultimate* Computer Store
MonarchComputer.com™ "We have what you're looking for!"
newegg.com®
TigerDirect.com
ZipZoomfly.com

Compiled by Steve Smith

The PS3 Is Coming: Watch Your Wallet

You have until Nov. 17 to save those pennies (all 59,900 of them) to nab the fully equipped version of Sony's PS3.

This Christmas, Sony raises the entry level for next-gen console play by a couple hundred dollars. Long awaited and formally announced at May's E3, the PS3 will come in two pricey tiers: a $499, 20GB model and a $599, 60GB version that also includes built-in Wi-Fi connectivity and HDMI output port. Sony believes that with a BD (Blu-ray Disc) hi-def drive and Cell processor onboard, the PS3 may actually be underpriced, according to an aside made to the Japanese press by President Ken Kutaragi. Perhaps the most intriguing piece of the PS3 is the motion-sensing Bluetooth controller. The new dual-analog stick can detect six degrees of hand movement (side to side, front to back, and lifting up or down). So now our PS3 games should know when we throw our controller against a wall in utter frustration? ▲

A 3D Mouse In The House

Like the hunt for extraterrestrial life, the search for the perfect FPS peripheral is eternal. At this year's E3, the forthcoming $79.99 Sandio Technology Game O' mouse promised "six degrees of freedom." Hoping to dispense with the classic WASD directional keys, the Game O' puts a joystick-like movement controller on the top and sides of the unit to control movement tasks, pitching and twist maneuvers ordinarily placed on keyboards, while the standard mouse movements handle typical facing and clicking tasks. Sounds cool, and this might yet work for some gamers, but a few who tried the prototype at E3 came away disoriented by trying to do it all with one hand. "Your head just explodes. It's a terrible thing," said ArsTechnica.com's Ben Kuchera. And, of course, the idea in a shooter is to make the *other* guy's head explode. ▲

The 3D Game O' mouse hopes to make FPS gameplay one-handed at last.

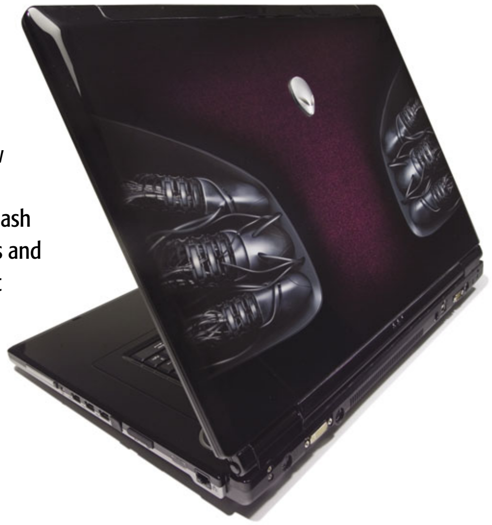
Sennheiser's Sweaty Buds

We know this is gross, but the reality of MP3 players is that the earbuds don't hold up well to athletic activity. Cushions get soaked or even shorted out with sweat, and the poorly contoured buds always drop out. Our new favorite answer to this very real real-world dilemma is Sennheiser's MX 75 Sport phones. Their rubberized sleeves and unique "twist-to-fit" anchors keep these bright and clear phones safely in the outer ear and resist rain and sweat. The kit even includes anchors of various sizes to accommodate any ear shape. ▲

No more falling buds with Sennheiser's new MP3 phones that "twist-to-fit" your ear canal.

Meet The New Boss, Same As The Old Boss

Alienware seems determined to prove that despite new ownership by buttoned-down Dell, its tech specs remain out of this world. Unveiled at E3, the 19-inch Aurora mALX portable pushes the definition of "laptop" to new limits. Dual Nvidia GeForce Go 7900 GPUs drive this monster display with some help from the AMD Turion 64 Mobile at its core. And if you feel limited by standard notebook hard drives, then you can string together two SATA drives for up to 240GB of storage. But why stop there when you also get next-gen Wi-Fi in the form of Airgo's integrated MIMO wireless chipset, which is capable of Ethernet-like speeds. And this is a true alien monster: It crushes your lap at 15 pounds and eats your wallet with a starting price of $4,499. ▲



Alienware's new mALX monster portable will smash your quadriceps and strip your wallet before you even pop open the massive 19-inch LCD.

Hardware Mole

Broadband At 100mph

Although we don't recommend driving at high speeds while trying to traverse the Internet, Omniwav Mobile (www.omniwav.com) says that you could do this with the WAAV CM3 Cellular Router ($379). Designed as a router for your car, the WAAV connects to 3G cellular networks and makes the bandwidth available for up to 50 people (for really big cars, no doubt) via Ethernet or Wi-Fi. When stationary, the unit can distribute broadband up to 300 feet, but Omniwav Mobile also says it works in a car traveling at up to 100mph. We thought talking on the cell phone while driving was unsafe. ▲

WAAV CM3 should keep everyone in your vehicle wirelessly connected at up to 100mph.

A Traffic Cop For Home Networks

The mushrooming home network market is now sprouting its own class of peripherals. The Linksys Network Optimizer claims to cure the hiccups and bandwidth-sharing problems that plague online gaming and VoIP connections. The $69.99 model OGV200 is about the size of a deck of cards and sits between the broadband modem and your router. There's no manual setup, says Linksys. The device automatically distinguishes time-sensitive data streams such as digital phone calls and online game action and gives them top priority in the stream. ▲

Linksys' new network traffic optimizer promises to reduce lag and burps for high-priority data streams.

Is Pre-802.11n Premature?

Even as Linksys, Netgear, and Belkin sell routers and wireless network cards based on a mere draft of the eventual 802.11n Wi-Fi specs, that standard remains uncertain. The IEEE committee assigned to ratify such things failed to move the current 802.11n spec forward for final approval. All of those pre-802.11n routers already in the field may have been launched prematurely, critics warn. As no one knows for sure what shape the final 802.11n spec will take, it's increasingly unclear whether a firmware upgrade will make the pre-802.11n routers truly 802.11n compatible, let alone interoperable. ▲

We love the tricked-out antennae on the new wireless routers and cards based on the "draft" of the 802.11n standard, but will this pre-802.11n hardware really be up to the final spec?

Compiled by DeanTakahashi

IntellaSys Debuts A 24-Processor Chip Array

IntellaSys, a startup in Cupertino, Calif., has launched a new family of chips dubbed SEAforth (Scalable Embedded Array; SEAforth-24A and SEAforth-24B). There are 24 processors on a single SEAforth chip, with each one of the processors capable of executing 1 billion instructions per second. The company says the chip dissipates only 150 milliwatts of power in a typical application. IntellaSys also says manufacturers can use the chips in a wide range of applications in which performance-per-watt metrics matter. The company is hoping to target embedded wireless and portable applications, says CEO Chet Brown. The SEAforth-24 processor will debut in the fourth quarter of 2006 at $19.95 per 1,000-unit quantities. ▲

ARM Launches Cortex-R4 Processor For Next-Generation Low-Power Electronics

ARM unveiled its Cortex-R4 processor at the Spring Processor Forum 2006, seeking to widen its scope with embedded devices. Already the architecture of choice for many mobile phones, ARM hopes to expand its reach to high-performance, low-power applications with this new chip. The company configured the chip to fit applications such as wireless and car applications, hard disk drives, and printers, among others. The processor also has the Thumb-2 instruction set, which enables it to replace two separate processors in 3G cell phones. ARM says the chip is currently available for licensing and has several lead licensees for the chip, including Broadcom. ▲

Watching The Chips Fall

Here is pricing information for AMD and Intel CPUs.

*Retail price
** Manufacturer's price per 1,000 units
Other current prices, if indicated, are lowest OEM prices available through Pricegrabber.com

CPU	Released	Original price	Last month's price	Current price
AMD Athlon 64 FX-60	1/10/2006	$999**	$1,011	$934
AMD Athlon 64 X2 Dual-Core 3800+	8/1/2005	$354**	$287	$291
AMD Athlon 64 X2 Dual-Core 4200+ energy efficient	5/16/2006	$417**	N/A	$417**
AMD Athlon 64 X2 Dual-Core 4200+	5/31/2005	$537**	$347	$350
AMD Athlon 64 X2 Dual-Core 4400+ energy efficient	5/16/2006	$514**	N/A	$514**
AMD Athlon 64 X2 Dual-Core 4400+	5/31/2005	$581**	$447	$456
AMD Athlon 64 X2 Dual-Core 4600+ energy efficient	5/16/2006	$601**	N/A	$601**
AMD Athlon 64 X2 Dual-Core 4600+	5/31/2005	$803**	$543	$539
AMD Athlon 64 X2 Dual-Core 4800+ energy efficient	5/16/2006	$671**	N/A	$671**
Intel Pentium Processor Extreme Edition 955 3.46GHz dual core	12/27/2005	$999**	$1,018	$1,008
Intel Pentium 4 631 3Ghz 2MB cache 800MHz FSB 65nm	12/27/2005	$178**	$174*	$149*
Intel Pentium 4 641 3.2GHz 2MB cache 800MHz FSB 65nm	12/27/2005	$218**	$216*	$207*
Intel Pentium 4 651 3.4GHz 2MB cache 800MHz FSB 65nm	12/27/2005	$273**	$272*	$269*
Intel Pentium 4 660 3.6GHz 2MB cache 800MHz FSB 90nm	2/21/2005	$605**	$329*	$329*
Intel Pentium 4 661 3.6GHz 2MB cache 800MHz FSB 65nm	12/27/2005	$401**	$400*	$400*
Intel Pentium 4 670 3.8GHz 2MB cache 800MHz FSB 90nm	5/26/2005	$849**	$603*	$610*
Intel Pentium D 820 2.8GHz dual-core 2MB cache 800MHz FSB 90nm	5/26/2005	$241**	$197*	$171*
Intel Pentium D 830 3GHz dual-core 2MB cache 800MHz FSB 90nm	5/26/2005	$316**	$254*	$260*
Intel Pentium D 840 3.2GHz dual-core 2MB cache 800MHz FSB 90nm	5/26/2005	$530**	$341*	$345*
Intel Pentium D 920 2.8GHz dual-core 2MB 800MHz FSB 65nm	12/27/2005	$241**	$229*	$203*
Intel Pentium D 930 3GHz dual-core 2MB 800MHz FSB 65nm	12/27/2005	$316**	$317*	$200*
Intel Pentium D 940 3.2GHz dual-core 2MB 800MHz FSB 65nm	12/27/2005	$423**	$421*	$262*
Intel Pentium D 950 3.2GHz dual-core 2MB 800MHz FSB 65nm	12/27/2005	$637**	$625*	$341*

Transmeta Creates New Efficeon Chip For Mystery User

Transmeta seems to be making good on its plans to create custom microprocessors for hardware customers who want low-power technology. The company said last year it had 30 engineers working with Microsoft on a secret project. Now the Santa Clara, Calif., chip-design company says it has created a new low-power version of its Efficeon microprocessor for an unnamed user. (Analysts believe the chip will be part of a future Microsoft handheld system.) CTO David Ditzel says that the chip consumes less than 1 watt when operating at 700MHz (or consumes less than 4 watts when operating at 1.5GHz). Ditzel also showed Quake running on the chip at the recent Spring Processor Forum 2006. Ditzel says that Transmeta is happy with its project with Microsoft and has no plans to compete directly with Intel. ▲

What's Happening • Internet

Compiled by Trista Kunce

Warner Bros. Movies The BitTorrent Way

In a move that's sure to encourage other Hollywood studios to put their films online, Warner Bros. has announced that it will supply its movies and TV shows online via P2P technology at BitTorrent.com. The two companies joined forces in May, but an exact launch date for the service wasn't set at the time of this writing. Also, the cost of downloading movies and TV shows hasn't been announced, but several news sources estimate that it could cost about $1 to download a single TV episode and about the cost of a DVD to download a full-length movie. Downloading a Warner Bros. film obviously won't be as fast as downloading music from BitTorrent's Web site, but the more people that download a film, the faster you'll be able to download it. If you do decide to download a Warner Bros. flick from BitTorrent, you'll be able to burn it to a DVD; however, films will only play on the computer from which they are downloaded, and they won't play on home DVD players. If you're the type who needs instant gratification and likes to watch movies anywhere, then this movie/P2P combo might not appeal to you. ▲

Yahoo! Spruces Up The Ol' Home Page

Yahoo! has cleaned up its home page and is letting users test out the beta version (yahoo.com/preview) before it becomes the company's default home page. The new page combines user-friendly features to help users search fast (tabs), find "real" answers from "real" people (Yahoo! Answers), instantly check out email, listen to Launchcast stations, get instant messages and local weather (Personal Assistant), and much more. (And, like MSN.com, you can choose the color of your Yahoo! Web page.) Yahoo! isn't the first portal to renovate its Web page. MSN, Google, and Ask.com have all recently undergone changes to make their portals less clutter-filled and more user-friendly. ▲

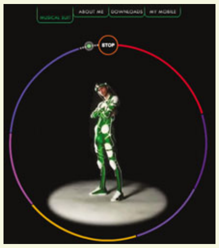
And The Breakout Of The Year Award Goes To . . .

Webby Award: "The international award honoring excellence in Web design, creativity, and functionality." Although the Webby Award winners were announced back in May, the winners weren't scheduled to celebrate until June 12. This year there were 65 award categories (the most ever), and several well-known sites won awards, such as Google (for Google Earth and Google Maps), the WashingtonPost.com, and MySpace.com (Breakout Of The Year). Standouts included NPR, which received six nominations and won four awards. To check out a list of all winners, go to www.webbyawards.com/webbys/current.php?season=10. ▲

Site Seeing

Better Than Subservient Chicken?

Back in 2004 Web surfers were introduced to Burger King's Subservient Chicken; a creepy-looking chicken willing to do almost anything you typed in the Web site's command field. In 2006 Web surfers get to make Pjotro (www.pjotro.com), in his green, musical suit, dance to a song they create. (You can even download this song to your cell.) If you're tired of the boring chicken, visit Pjotro's Web site, create some music, and make the man dance. ▲



Combine Technology & Nature

Are you interested in exploring the "symbiosis between nature and technology"? Then check out EcoGeek (www.ecogeek.org) where you can find all the ecogeeky information you crave. For instance, learn more about the latest ecogeek fashions at the Ethical Fashion Show in October. Not interested in fashion? Check out the posts about the latest organic energy drink or Scuderi's new "Air-Hybrid" engine. ▲

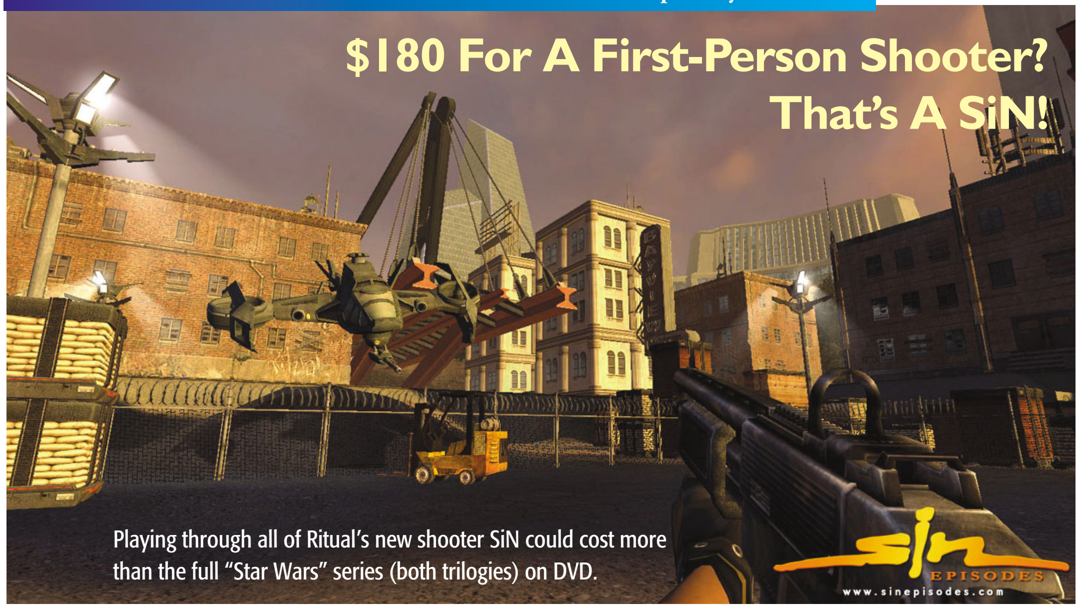
"The Prada Of Online Video"

Online video Web sites have been all the rage this year. So why not add one more to the mix? Arik Czerniak, CEO of Metacafe.com, says the site is the "Prada of online video," because you'll see only the "best" videos on the site. We've watched videos on Metacafe.com (for testing purposes, naturally), and we're happy to report that it was a fantastic way to procrastinate. ▲

What's Happening • Software

Compiled by Steve Smith

$180 For A First-Person Shooter? That's A SiN!

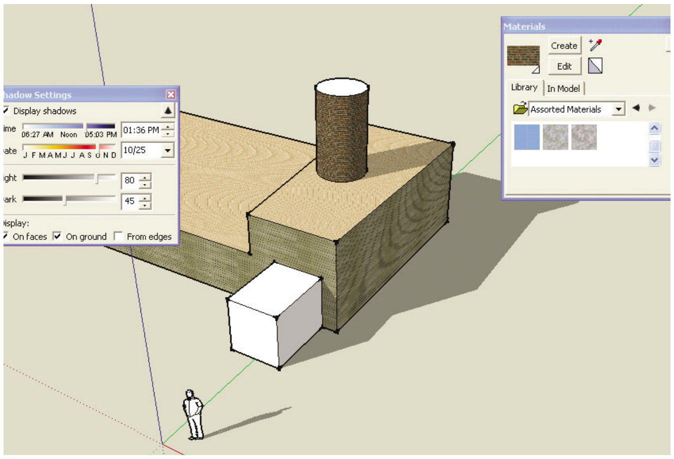


Playing through all of Ritual's new shooter SiN could cost more than the full "Star Wars" series (both trilogies) on DVD.

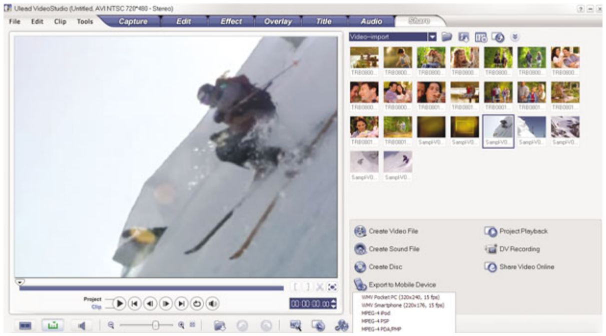
You think the PS3 is expensive? Wait until you see the new economy of episodic game distribution. Ritual Entertainment is selling its SiN shooter in nine "episodes." Each four- to six-hour chunk of FPS action is a self-contained four- to six-hour storyline available via Valve's Steam download service for $19.95 apiece. If you like shorter gameplay at a bargain price, this seems like a good deal. But what if you get hooked? Run the simple math: $179.55 to play all SiN episodes. Expect more of same, as many game companies see in connected Xbox 360s and PS3s an excellent opportunity to issue video games much like serialized TV shows, by the episode but for a fee. ▲

Your Scratch Pad Gets Trippy

Picasa we understand. Google Earth we get. But in its latest software release, SketchUp, we weren't sure at first why the world's biggest search engine was giving us a free 3D-design application. Oh, who cares? Google's recent acquisition of @Last Software has resulted in this terrific download that lets any doofus with a mouse (that would be us) build, texture, and shadow 3D models in minutes. It's like CAD meets Play-Doh: The intuitive tools push and pull objects into all manner of shapes and dimensions. The lighting tools even set appropriate shadows for any time and date. Finally, you can insert your SketchUp models directly into Google Earth. Now you can make virtual 3D worlds, while Google conquers the real one. ▲



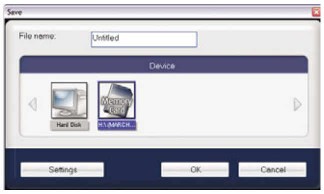
Google's latest offbeat thingamabob is a 3D-modeling program for the rest of us.



Video Studio 10 is among the first video-editing suites to transcode and transfer video projects to your portable devices.

Edit Once, Send Everywhere

Video is the new audio, with footage now going to PSPs, iPods, and phones—let alone to home theaters. It may be time to upgrade that old suite that came with your DVD burner. One option, VideoStudio 10 Plus from Ulead and InterVideo, pulls video from HD sources, splices and dices, and then spits it out in MPEG-4 format directly to your iPod or PSP. To manage CPU overhead with HD, a Smart Proxy feature converts those massive data streams to lower-res files for editing purposes and then applies those edits to the HD stream in the output stage. VideoStudio 10 Plus ($99.99) has all the bells and whistles for advanced users, while the standard version ($69.99) is more streamlined and clear for Mom and Dad. ▲



Software Shorts

Opera Mini Takes An Encore

The Opera Mini mobile browser gets a 2.0 upgrade and is still free if you point your Java-enabled phone to mini.opera.com. This version feels to us even faster than the first at rendering standard Web pages into navigable handset format. Bookmarks now get shortcut keys, the browser is skinnable, and you can assign multiple engines to query from the search box. Although the feature was a bit dodgy when we tested it, Opera 2.0 is supposed to let certain phones download images and MP3 files. Regardless, Opera Mini 2.0 is one of those must-try marvels. ▲

Faster and with more search options, Opera Mini 2.0 shrinks the Web down to handheld size.

Play Along With Your MP3s

We don't usually get too excited about the 11th version of any program, let alone an audio editor, but the new Magix Music Maker 11 deluxe boasts one unique and cool feature we haven't seen before. Its Harmony Agent analyzes an existing music track to find the chords in a song. Guitar players know what that means. Now you can upload any song from your digital library and see the chords flash in a video window in order to play along. ▲

Just A Little iTunes Envy, Ya Think?

With its bulbous buttons, cleaner interface, and a much more visual approach to organizing a music library, Microsoft finally gets serious about taking on iTunes with its beta release of Windows Media Player 11. You can also make the MTV Urge digital music service WMP 11's music store. We were happy to see WMP 11 find and catalog almost every piece of audio on our hard drive, including Napster and Audible purchases (no iTunes, so far as we can tell), and pull down album art automatically. The synchronization with remote devices is much improved, and WMP 11 even passed music on to our iPod. Keep in mind that you can't uninstall WMP 11; you have to do a System Restore to a Restore Point WMP 11 makes before installation in order to back out to WMP 10. ▲

Mañana, Mañana Vista

As predicable as security holes in Internet Explorer, Vista is likely to suffer more delays, according to several industry analysts. Gartner pundits say the pace of test version releases suggest that a March or June 2007 Vista launch is more likely than the January 2007 date Microsoft claims. Microsoft insists that it's on course to make its deadline, with the release of Vista for business customers planned for November and a consumer launch in early 2007. ▲

Analysts and Microsoft differ over whether Vista will appear as expected in early 2007.

BIOS Upgrades Available Online

Compiled by Steve Smith

Before you send another motherboard to the landfill, consider upgrading the BIOS and giving your PC a new lease on life. Here are a few recently released upgrades. Readers can check out www.cpumag.com/cpujul06/bios to see our entire upgrade list.

Motherboard	Date Available	URL
Abit Fatal1ty AN8 SLI	2/13/2006	www.abit-usa.com/downloads/downloads.php?file=/downloads/bios/an8/an820.zip
AOpen i975Xa-YDG	4/24/2006	download.aopen.com.tw/Download.aspx?RecNo=10763&Product=Motherboards&Model=i975Xa-YDG&Type=BIOS&DownSize=532.1&fileURL=pub%2fbios%2fi975xa-ydg%2fwica13.zip&Section=8&DL=yes
ECS K8M800-M2	4/18/2006	www.ecs.com.tw/ECSWeb/Downloads/ProductsDetail_Download.aspx?CategoryID=1&Typeid=22&detailid=555&DetailName=Bios&DetailDesc=K8M800-M2&MenuID=35&LanID=9
MSI K8N Neo4-FX	4/17/2006	download.msi.com.tw/support/bos_exe/mbd_bios/7125v35.zip
Shuttle SD11G5	3/24/2006	ftp://ftp.shuttle.com/BIOS/sd11g5/sd11s00l.bin

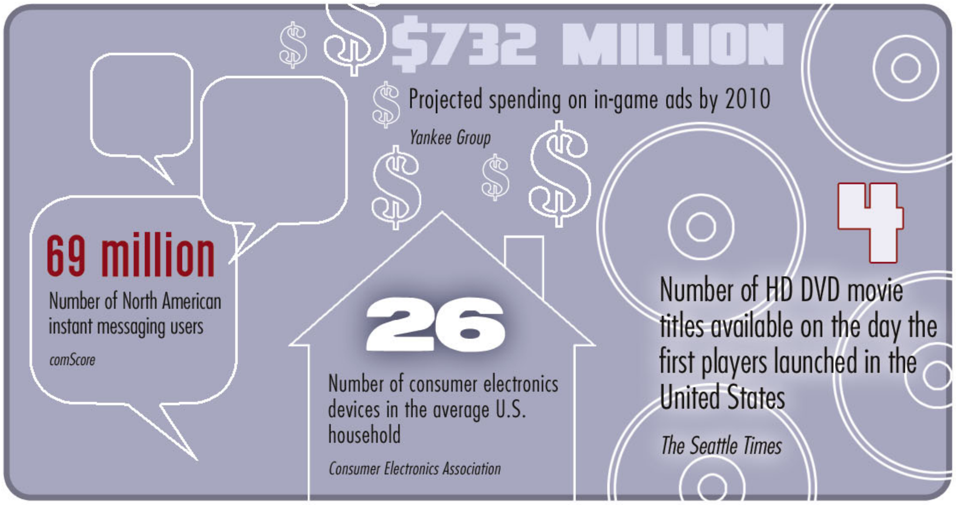
DIGITAL ECONOMY

Compiled by Steve Smith

The Job Search

Want to go to the front lines of the next-gen DVD format wars? Pick your side, geek soldiers. If you're fighting for the BD (Blu-ray Disc) team, you could find a new job at Panasonic as Media Production Specialist. We don't know how many people are out there who know BD well enough to actually program the titles, but the company says it wants you if you do, especially if you code Java/SQL/HTML well. You will get your hands dirty creating BD menu navigation flows, which surely becomes an issue when you have 30GB or 40GB of storage space to play with.

Or, if you don't want to play favorites but have a broad range of software programming and engineering skills, then work for one of the chipmakers that may power both standards. Broadcom needs someone with an extensive C background who can help design its next-gen SoC for both HD DVD and BD. Your team will write the firmware for copy protection and high-speed graphics, among other things.

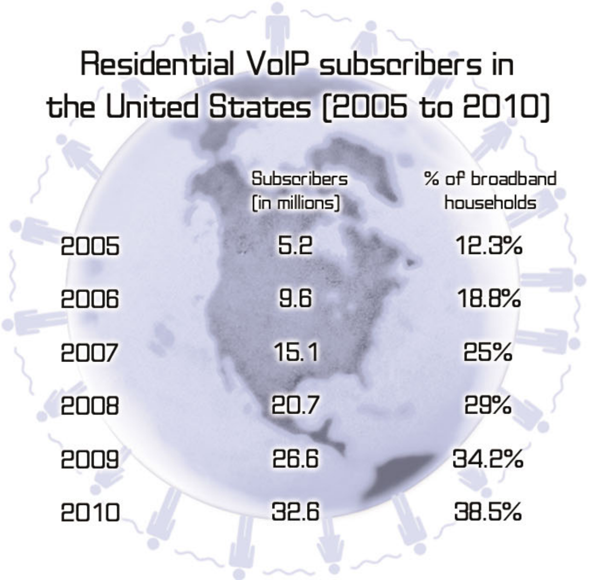


$732 MILLION
Projected spending on in-game ads by 2010
Yankee Group

69 million
Number of North American instant messaging users
comScore

26
Number of consumer electronics devices in the average U.S. household
Consumer Electronics Association

4
Number of HD DVD movie titles available on the day the first players launched in the United States
The Seattle Times



Residential VoIP subscribers in the United States (2005 to 2010)

	Subscribers (in millions)	% of broadband households
2005	5.2	12.3%
2006	9.6	18.8%
2007	15.1	25%
2008	20.7	29%
2009	26.6	34.2%
2010	32.6	38.5%

VoIP Goes Off The Hook

VoIP phone services are growing so fast that eMarketer predicts almost 40% of all broadband households will hang up on their traditional phone companies and go VoIP by 2010.

Source: eMarketer

Girls Got Game

According to the Consumer Electronics Association, a much higher percentage of young, adult women now play video games than men. How could that be? Ever see a soccer mom glom onto Bejeweled or dive into a session of EA's monstrously popular Pogo.com? Casual gaming is at least as addictive as Project Gotham Racing.

65%
Percentage of women 25 to 34 who play electronic games

35%
Percentage of men 25 to 34 who play electronic games

Source: Consumer Electronics Association

Monkeys Banging On Keyboards

by Alex St. John

Alex St. John was one of the founding creators of Microsoft's DirectX technology. He is the subject of the book "Renegades Of The Empire" about the creation of DirectX and Chromeffects, an early effort by Microsoft to create a multimedia browser. Today Alex is president and CEO of WildTangent, Inc., a technology company devoted to delivering CD-ROM quality entertainment content over the Web.

I don't even know where to begin this month.

I detect a great disturbance in the collective stupidity of the universe and its conspiring to screw up my PC. It began when my now-jacked-up Dell XPS laptop caught a virus, despite the fact that I was running both Symantec and Windows Defender on it. Neither of these applications, which never seem to shut up when I'm trying to use my computer for everyday applications, had any helpful pop-up warning dialogs for me when a bug called Pipas.A came calling. The Pipas.A virus was actually more helpful in that it politely informed me that it had invaded my computer and recommended Stopzilla for all my antispyware needs. I briefly considered trying it . . . before downloading PC Tools. PC Tools' only value-add was to try to install a Google Toolbar on my machine before proceeding to lock up my computer.

I found a variety of tools at Microsoft.com that promised to fix my machine, including some destined to ship with Vista, but none of them identified the virus or any of the four adware products it installed. This leads one to wonder: If Microsoft can't even identify a virus, how can it possibly know how to make a secure OS? I later determined that the virus I had was over a year old and was well-documented on the Internet, so nobody has any excuses for missing it. Finally I called out the big guns. As I've mentioned in previous columns, using Spybot-S&D is a little like using hydrochloric acid to remove a spot on your clothing; it rids you of the spot and a good deal of the fabric. Spybot-S&D identified eight common, harmless applications I use frequently as spyware, including several video games from my own company, but at least it caught Pipas.A (forums.spybot.info/showthread.php?t=2113). Of course, after Spybot-S&D did its "drive-by cleaning" of my computer, it took several hours to reinstall the legitimate applications it had clipped in the process.

Now that my computer is finally "clean," I can go back to writing sunny, optimistic columns about all the wonderful new features of the upcoming Vista OS. For example, according to Microsoft, Vista has a new memory manager to facilitate booting its own fat ass faster. And it requires DirectX 9 graphics cards just to run its own bloated new UI. I can't wait to see pixel-shaded 3D security warning dialogs!

The press asks me all the time why Vista is so late. I had a thoughtful, well-considered answer to that question from my days at Microsoft back in the 1990s, but now I think it just takes that long for monkeys banging randomly on keyboards to create an OS.

I seem to be getting an unusually large amount of spam email while writing this column. It appears that Windows Update has helpfully decided to reboot my home mail server while I am away in the process of installing a "critical security update," thereby breaking my spam blocker. Unfortunately I can't get through the hotel firewall to restart it, so I'm stuck with the spam until I get home. Perhaps Microsoft has released a patch that prevents the year-old Pipas.A virus from invading my computer.

I should be so lucky; Microsoft lost a patent lawsuit last year and as part of the remedy has released a patch to break all clickable ActiveX controls in the browser, including many Flash applications. This is the second time in my recollection that Microsoft has used the update service to deliberately install software on trusting users' computers that breaks functionality to solve its own legal woes. The first time was breaking MS Java support back in 2003. Of course, my favorite Windows update releases are the ones where Microsoft just breaks things for no productive purpose in the name of security, as in WinXP Service Pack 2.

I really look forward to these monthly opportunities to share my wisdom and experience with all of *CPU*'s readers. I don't think of this as a column so much as a giant group therapy session.

Meanwhile, my little friend Pipas.A is back with a great offer on Viagra. Apparently Windows Restore backed it up for me before Spybot-S&D could fully eliminate it.

Many thanks to Pipas.A for making this month's column possible. ▲

I detect a great disturbance in the collective stupidity of the universe and its conspiring to screw up my PC.

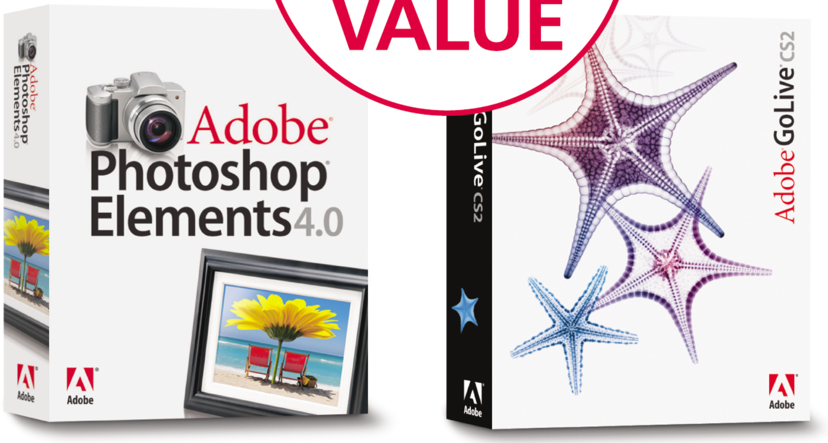
Send your feedback to TheSaint@cpumag.com

ISN'T IT TIME YOU CREATED

Discover the possibilities with 1&1!

Whether you're new on the web or a seasoned professional, you'll find everything you need at 1&1. We offer hosting solutions to meet every need.

FREE
Software Included
up to **$900**
VALUE

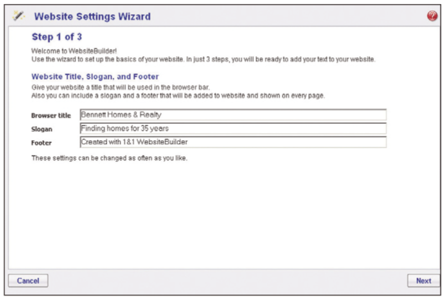


We're proud to introduce **Adobe Photoshop Elements 4.0** and **Adobe GoLive CS2**, just two of the great products included in our Premium Software Suite*, free with all business and developer shared hosting plans. Along with these powerful design tools, you also get **GIF Animator 5, Hello Engines 4.1 Professional, Tanking Toolbox 4.0**, and **WISE FTP 3.0** – everything you need to get started on the web.

1&1 WebsiteBuilder

4 easy steps…

1 Personalize your website



Step 1 of 3

Welcome to WebsiteBuilder!
Use the wizard to set up the basics of your website. In just 3 steps, you will be ready to add your text to your website.

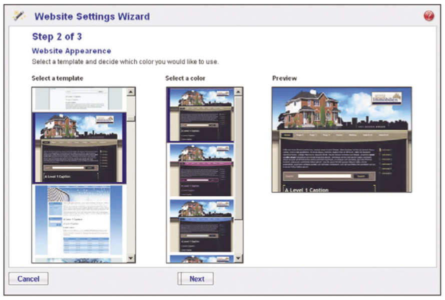
Website Title, Slogan, and Footer

Give your website a title that will be used in the browser bar.
Also you can include a slogan and a footer that will be added to website and shown on every page.

Browser title: Bennett Homes & Realty
Slogan: Finding homes for 35 years
Footer: Created with 1&1 WebsiteBuilder

These settings can be changed as often as you like.

2 Choose your layout



Step 2 of 3

Website Appearence

Select a template and decide which color you would like to use.

call **1.877.go1and1**

Member of united internet

---

*If you choose to receive the Premium Software Suite, the money back guarentee will not apply, and you must commit to a one-year contract for the package you choose. $6.99 shipping & processing fee applies.

YOUR WEBSITE?

90-DAY MONEY BACK GUARANTEE
The only one in the Industry!

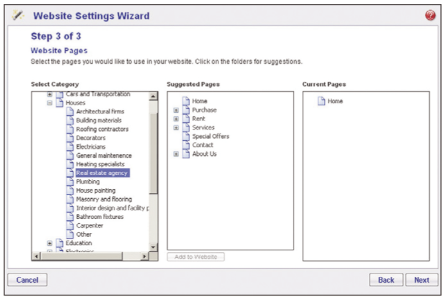
Compare for yourself!

FREE DOMAINS INCLUDED
.com, .net, .org, .info

	1&1	YAHOO!	Go Daddy
	BUSINESS	STANDARD	PREMIUM
Price Per Month	$9.99	$19.95	$14.99
Included Domains	3	1	$1.99/year with purchase
Web Space	100 GB	10 GB	100 GB
Monthly Transfer Volume	1,000 GB	400 GB	1,000 GB
E-mail Accounts	2,000 IMAP or POP3	500 POP3	2,000 POP3
Mailbox Size	2 GB	2 GB	10 MB
Blog	✓	✓	$2.99/mo. for ad-free blogs
Website Builder	18 Pages	✓	Freeware
Flash Site Builder	18 Pages	—	—
Photo Gallery	✓	✓	✓
Geographic Map	✓	✓	—
Driving Directions	✓	✓	—
Dynamic Web Content	✓	✓	—
Web Statistics	✓	✓	✓
E-mail Newsletter Tool	✓	$10/month	$9.95/year
In2site Live Dialogue	✓	—	—
Chat Channels	✓	—	✓
Form Builder	✓	✓	—
Database	50 MySQL	MySQL Support	50 MySQL
Search Engine Tools	✓	Extra Charge Applies	$29.95/year additional
Premium Software Suite	✓	—	—
90-Day Money Back Guarantee	✓	—	—
Support	24/7 Toll-free Phone, E-mail	24/7 Toll-free Phone, E-mail	24/7 Phone, E-mail

© 2006 1&1 Internet, Inc. All rights reserved. Prices based on a comparison of regular Linux prices effective 5/3/2006. Product and program specifications, availability, and pricing subject to change without notice. Visit 1and1.com for details. Go Daddy is a registered trademark of Go Daddy Software, Inc.; Yahoo! is a registered trademark of Yahoo! Inc.

3 Add pages



Website Settings Wizard

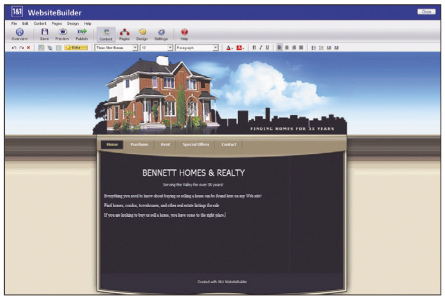
Step 3 of 3

Website Pages

Select the pages you would like to use in your website. Click on the folders for suggestions.

Select Category	Suggested Pages	Current Pages
Cars and Transportation Houses Architectural firms Building materials Roofing contractors Decorators Electricians General maintenence Heating specialists Real estate agency Plumbing House painting Masonry and flooring Interior design and facility p Bathroom fixtures Carpenter Other Education	Home Purchase Rent Services Special Offers Contact About Us	Home

4 Add text and publish



BENNETT HOMES & REALTY

Serving the Valley for over 35 years!

Everything you need to know about buying or selling a home can be found here on my Web site!

Find homes, condos, townhouses, and other real estate listings for sale

If you are looking to buy or sell a home, you have come to the right place

Created with 1&1 WebsiteBuilder

It's that simple.

or visit us now **1and1.com**

DREAM HARDWARE

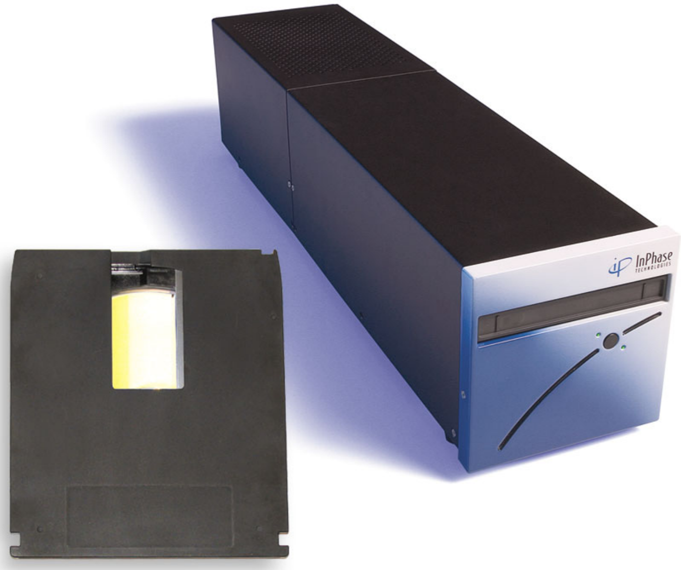
These Gizmos Don't Sing It, They Bring It

You don't know how your neighbor does it. Everywhere he drives that funny little car he winds up throwing an ad hoc tailgate party with new friends. You, on the other hand, can't seem to meet anybody. Perhaps if you turned off your wall-sized TV and went outside, you'd get invited over.

by Marty Sems

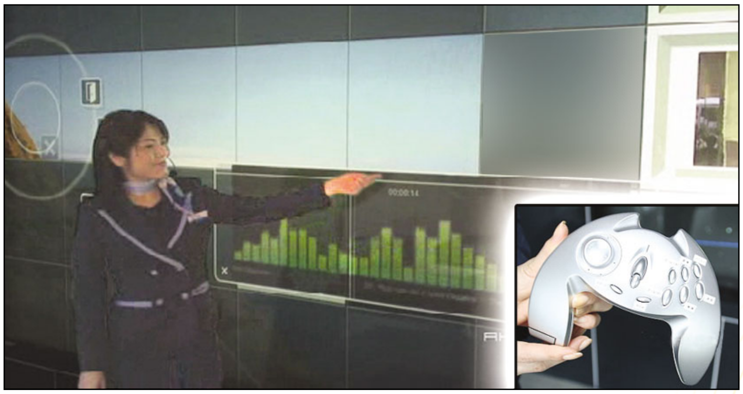
Scion FUSE

It's gangsta chic for tuner teens: the FUSE concept coupe from Scion (www.scion.com). It's mostly the media station in front of the passenger seat that concerns us here. Twin 10.5-inch displays offer movies and video games, Wi-Fi, and IM. Like a jet the FUSE is a drive-by-wire vehicle. Unlike a jet you can program the head- and fog lamps to change colors which, along with the flashy LED turn signals on the rims, may help you attract a mate, the state patrol, and/or a school of walleye. The FUSE unfolds into a party platform when you trip an infrared sensor on the rear bumper. This drops the tailgate to make a bench while the stereo throbs. There's even a removable drink cooler in the console. Potential pricing: "affordable."



InPhase Technologies HDS-300R

We've followed it for years, and now it's about to debut. Before year's end, InPhase will finally bring its holographic disc storage system to market (www.inphase-technologies.com). You may know that there are two 2D recording layers at different depths in a dual-layer DVD; however, a 1.5mm-thick holographic disc has a single recording layer that can store data in three dimensions using interference patterns from a pair of lasers. Each $120 Tapestry disc can hold up to 300GB with a data-transfer rate of about 20MBps. Initially, the media will come in 5.25-inch MO-style cartridges for compatibility with autoloading library systems, although spokesman Chris Pfaff says, "The technology can be used in any form factor, whether postage-stamp-sized media or smart cards." The $15,000 HDS-300R drive is intended for WORM archive duty in the enterprise, medical, broadcasting, and government markets. Bare disc and RW media will follow as the technology trickles down to the mainstream.



Panasonic Digital Wall

A wall in your home could ironically become your window to the world. Panasonic's System Soken lab designed and an outside vendor built this 220-inch projected touchscreen at the Panasonic Center in Tokyo. It turns an entire wall into a TV, Web browser, email client, and music center. Details are slim and availability not even that. Still, check out the large video at www.akihabaranews.com. The demonstrator lady shows off the Wall's cool interface features, "dragging" a jazz playlist from a virtual bookshelf and changing the music's equalization with a wave of her fingers. If a mere 103 inches can satisfy you, look up Panasonic's unnamed and unpriced plasma (www.panasonic.com). It should be available by year's end. ▲

Intel's New 975X Arrives

But How Does It Stack Up?

Time was when a new motherboard chipset was something worth celebrating. Each new release introduced a laundry list of new technologies and support for new generations of processors. These days new chipset releases have become so common, you may not even notice them. Intel first introduced its LGA 775 socket and PCI Express support with its 915 and 925X chipsets in June of 2004. By November the 925XE took over the enthusiast market and added 1,066MHz FSB speeds. In June of 2005, two new chipsets, the 945 and 955X, appeared. In November 2005 the 975X followed enabling the use of dual PCI-E video cards. I'll examine two 975X boards in this roundup: the Asus P5WD2-E Premium and the Foxconn 975X7AA-8EKRS2H to see how they compare. Then, to make things a little more interesting, I'll take a look at the Asus P5N32-SLI, which features Nvidia's nForce4 x16 SLI Intel Edition chipset.

Test Systems

Although both the Intel 975X and the Nvidia nForce4 x16 SLI Intel Edition support dual PCI-E graphics cards, they do so via different standards. The 975X uses ATI's CrossFire but not Nvidia's SLI standard, whereas the nForce4 SLI x16 Intel Edition doesn't play nice with ATI's CrossFire. In order to get a more accurate comparison of these boards, I decided to forgo dual PCI-E graphics and opt for a single Nvidia GeForce 4 6800 Ultra with 256MB of video memory.

I selected Intel's Pentium Extreme Edition 955 for my test processor. This dual-core processor runs Intel's 65nm Presler core and has a couple of additional enhancements over the older Smithfield cores, as well. Presler doubles the amount of L2 cache per core to 2MB (for a total 4MB of L2 cache) and it brings back the 1,066MHz FSB. The increase to a 1,066MHz FSB wasn't particularly impressive when paired with single-core processors, but the increased FSB may prove helpful when used in conjunction with dual-core processors.

Rounding out my test system is 1GB of OCZ DDR2-667 memory (broken down into two 512MB sticks of memory for dual-channel performance). A 74GB 10,000rpm Western Digital Raptor hard drive provided storage for my test system.

How I Tested

Before beginning my testing, I was sure to install the latest drivers and BIOS updates. I took the chipset drivers directly from Intel and Nvidia and downloaded the BIOS and additional hardware drivers directly from the manufacturer.

Once my system was ready to go, I ran both 3DMark06 and PCMark05 to gauge performance. Although 3DMark06 provides an excellent measure of the system's gaming performance, PCMark05 breaks down component scores nicely to show a board's particular strengths and weaknesses. Finally, to further gauge the system's gaming performance, I ran timedemos in Far Cry 1.33, Quake 4 1.2, and F.E.A.R. 1.04. I ran each timedemo three times and recorded scores from the third run only. I increased most game settings to the highest possible values with the exception of antialiasing, which I turned off. I ran both Far Cry and Quake 4 at 1,280 x 1,024 while setting F.E.A.R. to the maximum 1,280 x 960. In Far Cry I ran two very different timedemos. The Research demo limits itself to a single large room and usually provides the highest possible frame rates, while the Training demo takes you through multiple rooms and outdoor environments.

After recording my scores using the motherboard's default settings, I increased the clock speed to see just how far I could push each board. I used 3DMark06 to check for system stability any time I successfully booted Windows with an overclocked system. I then reran my complete suite of tests at the fastest stable speed I could achieve.

Intel 975X

As I mentioned earlier, Intel's 975X replaces the company's 955X chipset in the enthusiast market. In most ways, the 975X is very similar to the 955X. Both chipsets offer 533MHz, 800MHz, and 1,066MHz FSB compatibility and both accommodate Intel's latest processors (including the 955 Extreme Edition).

Test System Specifications

Processor	Intel Pentium Extreme Edition 955 (Presler)
RAM	1GB OCZ DDR2-667 (2x512MB)
Video card	Gigabyte GeForce 6800 Ultra (256MB DDR3)
Hard drive	80GB, 10,000rpm Western Digital Raptor
PSU	Antec TruePower 2.0 (550W)

Both chipsets include support for up to 8GB of ECC or non-ECC DDR2.

The biggest difference between the two chipsets lies in their support for dual PCI-E video cards. Like Nvidia's initial nForce4 SLI Intel Edition, the 975X provides a maximum of 16 lanes for graphics regardless of the number of cards installed.

Asus P5WD2-E Premium

We looked at the 955X-based Asus P5WD2 Premium last year for the *PC Modder 2.1* special issue and came away impressed (page 60). That board did particularly well running Doom 3 and Half-Life 2 at the time. The new 975X-based Asus P5WD2-E Premium replaces the older P5WD2 Premium at the high-end of the spectrum and, like its predecessor, posts some impressive performance numbers.

> The Asus P5WD2-E Premium, like its predecessor, posts some impressive performance numbers.

As I mentioned earlier, one big feature separating the 975X from the older 955X is support for dual PCI-E x16 video slots. Again, the 975X currently supports ATI's CrossFire standard for dual video cards. The added PCI-E x16 slot required Asus to reconfigure the expansion slots on the P5WD2-E Premium. You'll find a PCI-E x1 slot above the primary PCI-E x16 video slot and a PCI-E x4 slot beneath the primary video slot. The second PCI-E x16 slot sits below the PCI-E x4 slot. Three PCI slots fill out the expansion options.

On the southbridge is Intel's ICH7R, which supports RAID 0, 1, 5, and 10 across four SATA II ports. A Marvell 6141 allows for four additional SATA II ports, one of which can be external (you cannot use the fourth Marvell SATA port when using the external port). Both the ICH7R and the Marvell 6141 support a single IDE channel. The Marvell SATA and IDE connectors are located below the Intel ICH7R equivalents.

Marvell also provides two 8053 Gigabit LAN controllers. A Realtek ALC-882M codec provides the 8-channel high-definition audio. You'll find both optical and coaxial digital audio outputs on the rear I/O panel along with four USB 2.0 ports. Three included brackets provide additional connectivity options. One bracket includes a game port and two additional USB ports while two other brackets provide a 9-pin serial port and an IEEE 1394 connector. The TI 1394 controller can accommodate an additional 1394a connector on your case, as well.

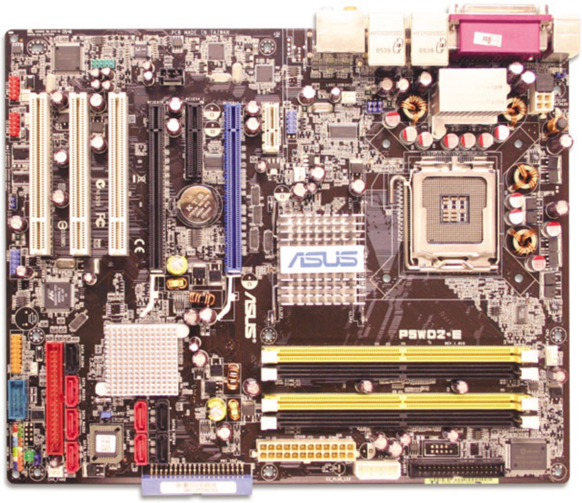
Layout

As with almost any board, the P5WD2-E Premium has a few layout glitches, but overall I much preferred its configuration to those of the other boards. In addition to supporting more SATA ports, the Marvell SATA ports are located conveniently in the lower-right portion of the board. My other boards placed the SATA port linked to the external port above the expansion slots. The area around the socket is relatively free of obstruction so most third-party heatsinks should work properly.

Unfortunately, larger PCI-E video cards may interfere with some of the Intel SATA ports if you install them in the secondary video slot. The CMOS battery is also located between the primary and secondary video card slots. Luckily, the Clear CMOS jumper is easily accessible even with two video cards installed so you shouldn't need ready access to the CMOS battery. If you install two video cards (or even a single video card with a large heatsink), you'll block access to the sole PCI-E x4 slot that's located between the primary and secondary video slots. You'll also lose access to one of the two PCI slots when running dual video cards.

Performance

Because I used newer benchmarks, I can't compare scores from the P5WD2-E to the scores *CPU* received from the P5WD2 a year ago, but I did see some familiar patterns. Like the P5WD2, the



Motherboard

Manufacturer	Asus
Model	P5WD2-E Premium
Northbridge	Intel 975X
Southbridge	Intel ICH7R
Audio	Realtek ALC882M (8-channel audio)
Ethernet	Dual Gigabit Ethernet
PCI-E x16	2
Universal PCI-E (Max x2)	1
PCI-E x1	1
PCI	3
Additional storage	4 SATA II ports via Marvell 6141
BIOS	0501
Chipset driver	7.2.2.1006
Video driver	84.21

P5WD2-E posted the strongest frame rates of any of the boards in this roundup. I also got some impressive 3DMark06 scores. PCMark05 scores, on the other hand, were somewhat mixed.

The 3172 3DMark06 score was the best overall 3DMark06 score posted and 135 points better than the next closest score. The P5WD2-E, however, couldn't quite keep up with the Foxconn 975X7AA when it came to PCMark05. The P5WD2-E managed a 5845 overall PCMark05 score, which was still better than the 5429 score posted by the P5N32-SLI Deluxe. PC-Mark05 component scores were mixed. The 6043 CPU score was the lowest PCMark05 CPU score I recorded as was the 4630 Memory score and the 4273 HDD score. The 5547 Graphics score, however, was the best default score recorded.

The P5WD2-E garnered decent frame rates in game benchmarks. In Far Cry it managed 119.53fps in a run through the Research map and 95.88 while running through the Training map. Training frame rates were a little lower than those from the Foxconn 975X7AA but the Research results were some of the best I saw. Quake 4 frame rates were slightly better than the P5N32-SLI Deluxe, but not by less than 2fps. The P5WD2-E handled F.E.A.R. better than any other board, posting 34fps.

The P5N32-SLI Deluxe has several more overclocking options for more advanced users, but the P5WD2-E handles increased clock speeds fairly well, although it seemed my processor had a hard time keeping up. I managed to get the FSB speed up to 300MHz, which brought the processor's clock speed up to 3.9GHz. The board reached these speeds rather easily, although I did have to bump up voltages a bit. At this speed, I got mixed results that were less impressive than my stock scores (all things considered). Sure, my 3D-Mark06 score was up, but only to a modest 3203. My PCMark05 overall score also saw a modest improvement to 5871. Despite the modest increase in PCMark05 scores, I saw dramatic increases in PC-Mark05 component scores. My CPU score increased dramatically to 6800 while my Memory score increased more than 500 points to 5153. My Graphics score also saw a decent increase from 5547 to 5721. As always, the HDD score remained relatively unchanged.

The increase in FSB speed, however, didn't translate into better gaming performance. Frame rates in Far Cry and Quake 4 dropped significantly and F.E.A.R. consistently crashed the system. Far Cry Research frame rates fell to 97.04fps and Training frame rates fell to a disappointing 22.64fps. Meanwhile, Quake 4 frame rates fell to 48.8fps. I was unable to get frame rates in F.E.A.R. at this speed.

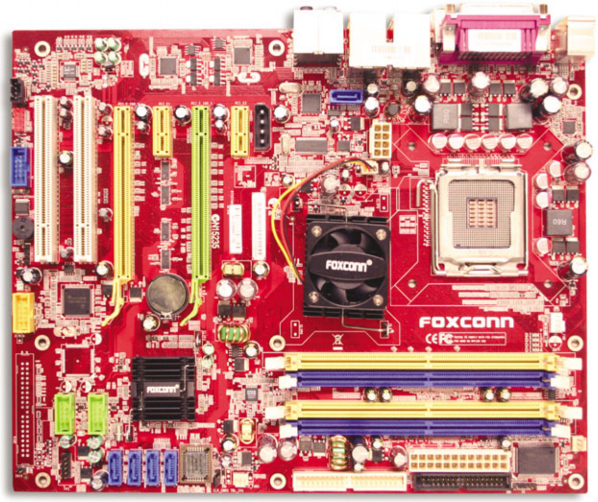
The Foxconn supports up to 6GB of dual-channel DDR2 memory across the four memory slots.

Foxconn 975X7AA-8EKRS2H

Foxconn sports a rather unique model naming scheme that, once you're familiar with it, tells you exactly what capabilities a given board has by the combination of numbers and letters that follow the dash. This particular board, for instance, supports 8-channel audio (8), FireWire 1394 (E), integrated Gigabit Ethernet (K), integrated RAID (R), SATA (S), and DDR2 (2). The scheme easily conveys the board's features, but it does make for a rather long name. To save trees, I'll be referring to this board as the 975X7AA.

As you can guess from the model name, this board uses Intel's brand-new 975X chipset on the northbridge, which provides the 1,066MHz FSB my dual-core Pentium Extreme Edition 955 processor requires. The board supports up to 6GB of dual-channel DDR2 memory across the four memory slots. Unlike in the past, Intel's new Flex Memory Technology lets you stick different capacity memory modules in the slots and still utilize dual-channel memory.

Perhaps the first things to jump out at you on this board are its two PCI-E x16



Motherboard

Manufacturer	Foxconn
Model	975X7AA-8EKRS2H
Northbridge	Intel 975X
Southbridge	Intel ICH7R
Audio	Realtek ALC882 (8-channel audio)
Ethernet	Dual Gigabit Ethernet
PCI-E x16	2
PCI-E x1	2
PCI	2
BIOS	597F1P23
Chipset driver	7.2.2.1006
Video driver	84.21

slots. As I mentioned earlier, the 975X is compatible with ATI's CrossFire technology but not yet compatible with Nvidia's SLI standard. As with Nvidia's nForce4 SLI Intel Edition, only 16 PCI-E lanes are available for video cards, so the number of available PCI-E lanes decreases to eight per card with two video cards installed. Two PCI-E x1 slots are available; although, my GeForce 4 6800 Ultra completely blocked one of the PCI x1 slots. Installing a video card in the second PCI-E x16 slot will likely block access to one of the two PCI slots.

On the southbridge you'll find Intel's ICH7R, which supports RAID 0, 1, 5, and 10 on four SATA II ports, as well as Intel's Matrix technology, which lets you run RAID 1+0 on just two hard drives. A second Silicon Image 3132 controller provides two additional SATA II ports. One port is mounted above the expansion slots and the other located on the rear I/O panel for external SATA storage devices.

The Realtek ALC882 High-Definition audio codec provides 8-channel surround sound; you'll find both coaxial and optical digital audio output on the rear I/O panel. Two Marvell 88E8053 Gigabit Ethernet controllers provide network connectivity. You'll also find four USB 2.0 ports and one IEEE 1394 port on the rear I/O panel.

Layout

With video cards becoming larger and requiring larger heatsinks, laying out a motherboard's expansion slots isn't always easy, so I can forgive the blocked PCI-E x1 slot below the primary PCI-E x16 video slot. Aside from blocking some expansion ports, the layout was pretty decent. The 8-pin ATX 12V connector is a bit close to the CPU socket and might cause some issues with large third-party heatsinks, but in most cases you should be OK. The placement of the internal Silicon Image SATA II port isn't ideal as you'll have to run a SATA cable across the motherboard, but this is a fairly standard position on motherboards that incorporate an external SATA connector.

Nvidia's nForce4 SLI Intel Edition includes the necessary MCH that Intel processors require.

Performance

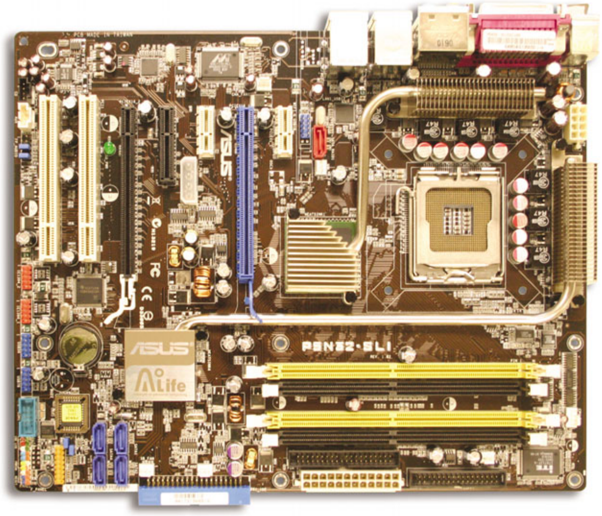
The 975X7AA couldn't quite keep up with the P5WD2-E; it managed just a 3004 3DMark06 score—the lowest of the bunch. PCMark05 scores were slightly more competitive. The overall PCMark05 score of 5729 was close to the P5WD2-E and better than the P5N32-SLI I looked at next. PCMark05 component scores were more disappointing. The 975X7AA posted a 6000 CPU score and a 4589 Memory score. The 5332 Graphics score was also disappointing while the 4310 HDD score was actually slightly better than the P5WD2-E (but then again, who buys a board based on hard drive performance?).

The 975X7AA fared much better in my timedemos. The 975X7AA posted 120.03fps in the Far Cry Research demo and 92.31fps in the Far Cry Training demo. The 975X7AA really shined in Quake 4 where its 69.3fps was the best score posted by any board in this bunch.

I had good success overclocking the 975X7AA up to a point. I was able to boot into Windows with a 300MHz FSB. Increasing the FSB to 325MHz, however, proved problematic. At that speed, the board refused to POST. Despite resetting the CMOS several times (using both the Clear CMOS jumper and the removing the battery), the system still refused to POST and I was unable to complete my test suite on this board.

Nvidia nForce4 x16 SLI Intel Edition

Nvidia also has a relatively new chipset available. The nForce4 SLI x16 Intel Edition is very similar to the older nForce4 SLI Intel Edition, except that it includes an nForce4 SLI chip on both the northbridge and southbridge. The result is support for 40 PCI-E lanes and the ability to devote 32 total PCI-E lanes for video.



Motherboard

Manufacturer	Asus
Model	P5N32-SLI Deluxe
Northbridge	Nvidia nForce4 SLI Intel Edition
Southbridge	Nvidia nForce4 SLI
Audio	Realtek ALC850 (8-channel audio)
Ethernet	Dual Gigabit Ethernet
PCI-E x16	2
PCI-E x4	1
PCI-E x1	2
PCI	2
Additional storage	1 external/1 intenernal via Silicon Image 3132
BIOS	0310
Chipset driver	4.5.0.0
Video driver	84.21

Adding a second card increases the number of lanes used for video from 16 to 32.

The nForce4 SLI x16 Intel Edition is compatible with FSB speeds from 400 to 1,066MHz, and with support for 4GB memory modules allows for a total system memory of up to 16GB, twice as much as you can use with Intel's 975X. The new chipset also officially supports the Extreme Edition 955, something that can't be said for Nvidia's older nForce4 SLI Intel Edition.

Asus P5N32-SLI Deluxe

Nvidia's original nForce4 chipset only supports 20 PCI-E lanes. As a result, the system can only spare 16 lanes for graphics, regardless of the number of PCI-E video cards you install. Typically, when you go to SLI, the number of available lanes per card gets reduced by half. Nvidia's new nForce4 SLI x16 Intel Edition changes all that.

This chipset uses a standard Nvidia nForce4 SLI Intel Edition chipset on the northbridge. As you know, AMD integrates its MCH directly onto its processors while Intel implements its MCH on the northbridge. Nvidia's nForce4 SLI Intel Edition includes the necessary MCH that Intel processors require. There's no need for an MCH on the southbridge, so Nvidia uses a standard nForce4 SLI chipset on the southbridge. The result is 40 available PCI lanes, 32 lanes of which are available for graphics. As a result, both video cards can utilize 16 PCI-E lanes.

Aside from the extra PCI-E lanes, the nForce4 SLI x16 Intel Edition has all the features I've come to expect from an Intel chipset. You get FSB speeds of 1,066MHz, 800MHz, and 533MHz and up to 16GB of dual-channel DDR2 memory. Intel's latest chipsets include Flex Memory Technology that lets users install different capacity memory modules and still take advantage of dual-channel memory. Nvidia doesn't offer the same feature, but most enthusiasts are probably using identical memory modules in their dual-channel systems, anyway.

The Asus P5N32-SLI Deluxe board I tested here includes Nvidia's nForce4 SLI x16 Intel Edition chipset. In addition to all the stuff mentioned above, it also supports two Ultra DMA IDE slots and four SATA II ports. NVRAID enables RAID 1, 0+1, 5, and JBOD on the SATA drives. An additional Silicon Image 3132 SATA controller provides one internal SATA port mounted above the upper-most PCI-E x16 slot and an external SATA port on the rear I/O panel. The external SATA port is the reason for the inconveniently located internal Silicon Image connector. The Silicon Image 3132 supports RAID 0 and 1.

Asus opted for the Realtek ALC850 audio codec, which provides 8-channel surround-sound audio. The board sports one coaxial and one optical audio output on the rear I/O panel along with the six standard speaker jacks. There are also two Gigabit Ethernet ports on the rear I/O panel. The integrated Gigabit Ethernet controller on the nForce4 SLI chipset mounted on the southbridge controls one port and a Marvel 88E8053 Gigabit Ethernet controller governs the second port.

Layout

With video cards constantly getting larger and manufacturers squeezing ever more features into high-end boards, real estate is at a premium and there are bound to be a few conflicts. Nonetheless, Asus has done a decent job of arranging this board's components. You can easily add or remove memory modules with a video card installed. If you're running in SLI mode, the second card may interfere with the primary SATA port. I recommend connecting your hard drive before installing the second video card. The second card may also block access to the Clear CMOS jumper making things a little difficult on overclockers. It's also going to be very difficult to use the PCI-E x4 slot with two cards installed.

Performance

Performance scores from the P5N32-SLI were a bit mixed. 3DMark06 came in with an overall score of 3019, which was well off the pace set by the P5WD2-E. While the board's 5429 PCMark05 score was the lowest score posted, PCMark05 component scores appeared quite strong. The 6097 was the best stock CPU score as was the 4751 Memory score. The 5361 Graphics score was slightly below that of the P5WD2-E and may be the reason why the P5N32-SLI fell a bit short in 3DMark06. The 4533 HDD score was significantly faster than the 975X7AA.

Gaming frame rates were strong and competitive. The P5N32-SLI managed 120.20fps during the Far Cry Research demo and 91.49fps in the Training demo. At 63.1fps, the P5N32-SLI posted the lowest Quake 4 frame rates of any of the boards, but it's not off by much. F.E.A.R. frame rates were also a little low at 31fps.

Overclocking proved to be a little tougher than with the other boards. I managed to get the FSB up to 280MHz resulting in a processor speed of 3.64GHz. At these speeds, I managed a slight 3DMark06 improvement (a 17 point increase). Despite its low overall PCMark05 score at stock speeds and not quite overclocking as high as the P5WD2-E, the P5N32-SLI still managed to post the highest overall PCMark05 score (5980). Component scores were less impressive. The 6407 CPU score was strong, but far from the 6800 posted by the P5WD2-E. The 4829 Memory score was strong, but the 5416 Graphics score was still lower than the P5WD2-E's stock Graphics score. The 4535 HDD score was still very good, but changed slightly with the overclock.

Far Cry frame rates fell with the increased speed. The Research demo yielded 112.11fps and the Training demo managed just 86.46fps. Quake 4 scores, however, did show improvement. At 64.8fps, the P5N32-SLI was just shy of tying the best Quake 4 frame rate. The increased speed gave me an extra 1fps in F.E.A.R.

Overall

Although the Asus P5WD2-E Premium provided the most overall punch, the Foxconn 975X7AA fell a little behind the Asus P5N32-SLI. As a result, it's difficult to say definitively whether the 975X is any better than Nvidia's nForce4 x16 SLI Intel Edition. In the end, your decision might come down to whether you're an ATI or Nvidia fan. ▲

by Chad Denton

Get Some (En)closure

Drive Accessories For Cooling & Accessibility

In lieu of installing hard drives into their cases in standard internal drive cages, many enthusiasts and power users prefer to sheath them in drive enclosures first in an effort to keep the drives cool and make them easier to remove. Some hard drive enclosures feature heatsinks and/or cooling fans to keep unusually warm running drives, such as Western Digital's 10,000rpm Raptors, cool. And because they have removable cartridges, they make installing and uninstalling drives from a system a snap, too.

I've pulled together a handful of HDD enclosures for this roundup that encompass the entire spectrum of products currently available; from a relatively basic, mostly plastic enclosure to a high-end, actively cooled, aluminum multibay unit. Depending on your particular requirements, one of these HDD enclosures is sure to fit your needs.

Bytecc MR-125B

Bytecc's MR-125B is the least expensive enclosure in this roundup, but don't let its low price fool you. Believe it or not, this enclosure actually has most of the features many people seek out in a removable HDD enclosure. Bytecc constructs the MR-125B almost entirely of lightweight plastic, save for some brass inserts for mounting the enclosure and the springs its latching mechanism uses. It supports any standard 3.5-inch SATA hard drive, it's hot-swappable, and it features a cooling fan and an easy-to-use lock.

MR-125B
$19
Bytecc
www.byteccusa.com
●●◐

Specs: Interface: SATA; Build Materials: plastic; Dimensions: 1.7 x 5.8 x 7.3 inches (HxWxD); Weight: 0.9lbs

Of course, for less than $20 the MR-125B doesn't include a drive. Then again, none of the units in this roundup do. To install and build up the MR-125B, any 3.5-inch hard drive and standard 5.25-inch drive bay will do. The removable cartridge that houses the hard drive comes apart by sliding off a cover on its top. Next you insert a hard drive with its connectors facing the rear and then install four screws on the underside to secure the drive in place. Finally, slide the top cover back on and you're done building up the removable cartridge.

The internally mounted portion of the enclosure is relatively sturdy considering it's made almost entirely of plastic. The rear of the unit has standard Molex and SATA power connectors and a standard SATA data connector. The front houses a power switch, activity and power indicator LEDs, and a spring-loaded cover that protects the enclosure's insides when the removable cartridge isn't inserted. Mounting the internal portion of the MR-125B requires nothing more than inserting it into an available drive bay and securing it in place with four screws. You must then connect the SATA data cable to your motherboard's drive controller and supply power via either the Molex or SATA power connector.

Inserting the removable cartridge is then a simple matter of sliding it right into the front of the unit and locking it in place by depressing a lever on its front. You can use a dial to the left of the lever to lock or unlock the cartridge. When it's unlocked, depressing the locking mechanism releases the lever on the front of the cartridge and then you can pull it out of the enclosure. However, with it locked the mechanism won't release the lever when you depress it to prevent unwanted removal of the cartridge.

Overall the MR-125B worked well. Its internal cooling fan had a bit of a high-pitched whine that I could have done without, but it wasn't loud by any means. If you're looking for an easy way to make your hard drive removable, the MR-125B would serve

Depending on your particular requirements, one of these HDD enclosures is sure to fit your needs.

SATA EZ-Swap Mobile Rack (MRK-200ST-BK)
$49
($29 additional cartridges)
Vantec
www.vantecusa.com
●●●◖

Specs: Interface: SATA; Build Materials: plastic and aluminum alloy; Dimensions: 1.7 x 5.8 x 9.3 inches (HxWxD), (cartridge only) 1.4 x 4.6 x 8.5; Weight: 1.6lbs (full kit), 0.9lbs (cartridge only)

you well, but there are other models available that have more features and are better constructed if you're willing to make a larger investment.

Vantec SATA EZ-Swap Mobile Rack (MRK-200ST-BK)

The Vantec MRK-200ST-BK is the Ferrari of single-drive, removable HDD enclosures. Unlike the MR-125B, which is almost entirely made of plastic, the MRK-200ST-BK is constructed mostly of a hard aluminum alloy with just a few plastic parts.

The MRK-200ST-BK incorporates about every feature modern removable HDD enclosures offer. It's compatible with all standard 3.5-inch SATA hard drives, and you can swap out said drives without turning off or opening the PC. Furthermore, building up and installing the MRK-200ST-BK is also a simple process. Like the MR-125B, you can slide the MRK-200ST-BK's cartridge off and insert and lock a standard 3.5-inch SATA hard drive in place by using four mounting screws on the underside. However, then you must slide the drive to the back of the cartridge to connect it to a custom PCB. You see, the MRK-200ST-BK uses a proprietary 64-pin connector as an interface between the cartridge and internally mounted receptacle, not the drive's connectors like the MR-125B. The cartridge features an aluminum casing with small fins that act as a large heatsink, and the receptacle has a small 40mm cooling fan at the rear. The aluminum casing in conjunction with the cooling fan does a good job of keeping the drive cool, but the fan emits a relatively high-pitched whine, somewhat similar to that of the MR-125B's fan noise, that could annoy some users; although, it didn't bother me at all.

The internal receptacle is made of two thick, aluminum rails and plastic front and rear end-caps. The rear of the unit houses the receptacle's 40mm cooling fan, a single SATA connector, and a single Molex power connector. No SATA power connector is present, however. The front fascia features a hinged dust guard (with the EZ SWAP brand silk-screened on its surface) and a lock. Vantec includes a key in this package that lets you set the lock in three different positions: locked with power on, locked with power off, unlocked with power off. This is a nice security feature that lets you disable a drive without having to remove the cartridge from its receptacle. To install the receptacle, all you have to do is insert it into a drive bay, tighten a few screws, and connect the necessary SATA data and Molex power cables.

Once inserted, removing the cartridge from the MRK-200ST-BK's receptacle is very easy. With the lock in its unlocked position, you must pull on a small, plastic lever that doubles as a handle. When the lever is perpendicular to the front of the unit, the cartridge is disengaged, and you can pull it right out of the system. I installed and removed the cartridge from the unit a number of times without incident, but the handle is plastic and could wear out over time.

Perhaps the most intriguing feature of the MRK-200ST-BK is its blue, back-lit LCD. The LCD and three function buttons that determine what's displaying on-screen are mounted at the left side of the removable cartridge. The screen displays temperatures, drive activity, and hard drive usage time. Vantec dubbed that last bit of data HUTR

MB453, MB454, MB455
$99, $139, $149
Icy Dock
www.icydockusa.com
●●●◖

Specs: Interface: SATA; Build Materials: plastic and aluminum alloy; Dimensions w/o fan: MB453 3.3 x 5.8 x 7.2 inches (HxWxD), MB454 and MB455 5 x 5.8 x 7.2 (w/ fan add 1.3 inches); Weight: 2.4 lbs (MB453), 3.5 lbs (MB454), 3.6 lbs (MB455)

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

MB454

(HDD Usage Time Record). You can also configure the controller that powers the display to sound an alarm when the drive installed in the enclosure hits a certain temperature threshold.

Consumers in the market for a feature-rich, removable HDD enclosure will likely be pleased by the Vantec MRK-200ST-BK. Other than the slight whine its cooling fan produces and its plastic removal lever, there's nothing I didn't like about this unit. Vantec also sells separate cartridges should users want to install different drives into the same receptacle.

Icy Dock MB453, MB454, MB455

Icy Dock offers a wide assortment of drive enclosures, each targeting a different audience. Some of the more well-rounded products in its lineup are in the MB45*X* series.

The Icy Dock MB453, MB454, and MB455 enclosures are all very similar. They all use the same cartridges and share the same base features. Icy Dock's HDD enclosures only differ in the number of drives they support and how you install them into a system. You need to mount the MB453, for example, in two 5.25-inch drive bays, and it supports up to three SATA hard drives. The MB454 requires three 5.25-inch drive bays and supports up to four hard drives. Finally, the flagship MB455 also requires three 5.25-inch drive bays, but it can support up to five drives because you can mount them vertically in the enclosure.

It was very easy to install the drives into the Icy Dock cartridge. The cartridge features a pair of aluminum drive rails with a vented plastic front bezel and aluminum handle. Unlike other HDD enclosures I've looked at, you don't have to disassemble anything with these. Slide the drive between the rails and secure it in place with some screws. When you insert the drive's connectors into a receptacle, they mate with a PCB at the rear. It was also easy to remove cartridges: There's a plastic button that releases an aluminum lever that runs the length of the cartridge's face, which you should grab and pull. A cam then eases the drive out of the connectors on the PCB, and the entire cartridge slides right out.

The internally mounted receptacles for all three of the Icy Dock multibay enclosures I looked at were constructed almost entirely of aluminum. The only plastic components were the fan and parts of the front bezel. Although the internal receptacles for the MB45*X* enclosures are larger than those of the MR-125B and MRK-200ST-BK, installing them is just as easy—provided your case has the room to accommodate their larger size and you have the appropriate number of SATA data and power cables to feed the drive and provide power. (These multibay units require Molex and SATA power cables.) The front of the receptacles has power, activity, and failure LEDs for all of the cartridges, as well as overheating and fan status-indicator LEDs. One thing missing from the MB45*X* family of products, however, are dust covers to protect the unit's insides when you remove the cartridges.

Other notable features of Icy Dock's MB45*X* family of multibay HDD enclosures include a removable (and replaceable) 80mm rear exhaust fan and a thermal controller that will sound an alarm if it reaches a certain temperature (113 degrees Fahrenheit, 131 F, or 149 F). Icy Dock's 80mm fan pushes much more air than either of the other units I looked at, and it doesn't produce the same high-pitched whine because of its larger size.

Icy Dock's MB45*X* enclosures may not have the flash of the Vantec MRK-200ST-BK, and they certainly aren't as inexpensive as Bytecc's offering, but they do strike a good balance and are solidly constructed. If you want the ability to easily swap multiple hard drives from a system, any of the products in the MB45*X* family would be a fine choice. ▲

by Marco Chiappetta

MB455

Seagate Barracuda 7200.10 750GB

It's a milestone: The first perpendicularly recording hard drive in a 3.5-inch form factor is Seagate's 7200.10. Manufacturers have been teasing us with 1.8- and 2.5-inch PMR units, but now desktop drives are in for a capacity rocket ride, too.

Seagate uses both sides of four platters to bring a 750GB capacity to the market for the first time. (WinXP's Disk Management reports the initialized, unformatted ST3750640AS's addressable capacity as 698GB.) That's a 50% increase over the previous high water mark of 500GB. This is the kind of capacity leap the industry promised with PMR, and the technology is still young.

Our labs were a little bare of recent drives in the 7200.10's ballpark, but I did locate a first-generation Raptor 74GB for comparison. Predictably for a dense Seagate drive (130Gb per square inch), linear transfers look phenomenal, but the quiet seeks make for so-so data access times. This one's a media server waiting to happen.

Seagate's brag list includes some new flair, such as G-Force Protection to park the heads if the drive suddenly accelerates, as when dropped. Directed Offline Scan runs diagnostics when the drive is idle. Adaptive Fly Height seeks to add a little control to the normally passive flight of the heads above the platters. And Clean Sweep simply means the drive passes the heads a full stroke across the platters at bootup to calibrate and "smooth out any irregularities in the disc surface"; the latter sounds a little scary when you're talking about infinitesimally low fly heights.

A five-year warranty, quiet operation, superb linear speed, and tremendous capacity—that's Seagate's new 7200.10. Oddly, the 750GB's external version is cheaper at $559, but it only comes with a one-year warranty. ▲

by Marty Sems

Barracuda 7200.10 750GB
$590
Seagate
(831) 438-6550
www.seagate.com
●●●●

Specs: Perpendicular recording, 1.5Gbps SATA (3Gbps SATA, ATA/100 optional), NCQ, 7,200rpm, 16MB cache (8MB in some capacities), 2.7 to 3dB, 11ms read seek, 300G non-operating (350G in some capacities)

Benchmarks * Lower is better	HD Tach avg/max read (MBps)	HD Tach avg/max write	HD Tach random access (ms)*	PCMark05	PCMark XP Startup (MBps)	PCMark General Usage	PCMark Virus Scan	IOmeter File Svr. (I/Ops)	IOmeter Web Svr.
Barracuda 7200.10 750GB	67.5 / 85	59.1 / 73	14.3	5789	9.1	5.8	90.6	95.83	115.24
WD740GD Raptor 74GB (first-gen)	65.1 / 72	63.5 / 70.5	8.1	6573	10.6	8.4	79.2	164.46	186.77

Sapphire Radeon X1900 GT

ATI recently took its R580 core, put it on a diet of Slim Fast bars, and trotted it out as the midrange X1900 GT. The move is surely a play to compete against the GeForce 7900 GT for the affections of those who are willing to sacrifice a smidge of performance in exchange for saving some cash. At a price noticeably lower than its X1900 brethren, the Radeon X1900 GT makes a few concessions, with a 575MHz core clock speed and a 600MHz memory clock speed.

Sapphire's Radeon X1900 GT sports 36 pixel shaders (a retreat from 48 on other X1900 boards), 256MB GDDR3 memory, and support for H.264 decoding with ATI's Avivo technology. For users who have little interest in CrossFire but want to maintain a semblance of playability on first-person shooters at moderate AA and AF settings, the X1900 GT should be up to the task. It should also be easier on your power supply, and its single-slot form factor is another plus.

In my tests, I was impressed, but not surprised, with the X1900 GT's scores. It turned in an overall score of 4487 in 3DMark06 and posted 1700 and 1887 in the SM2.0 and HDR/SM3.0 tests, respectively. The game tests, which I ran at 1,600 x 1,200 with 4XAA and 8XAF, certainly taxed Sapphire's card, but the card delivered almost playable results even with the quality settings ratcheted up. It ran through Far Cry, Quake 4, and F.E.A.R. at 57.72, 48, and 30fps, respectively.

I'm not holding my breath, but after Sapphire dropped its Radeon X800 GTO^2, it's conceivable that its Radeon X1900 GT has four pixel pipelines waiting for enterprising enthusiasts to unlock. The R480 GPU was a little long in the tooth when it landed on the Radeon X800 GTO^2, but the thought of modded X1900 GT in a CrossFire setup is a juicy proposition. We'll keep you posted if this notion bears fruit, but the Radeon X1900 GT is a decent card in its own right. ▲

by Vince Cogley

Radeon X1900 GT
$299
Sapphire
(909) 594-0597
www.sapphiretech.com
●●●◖

Specs: R580 graphics core (575MHz), 256MB GDDR3 memory (600MHz), dual-DVI, one of four free games

CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

Biohazard Annihilation Quad SLI Edition

Taking its "the more, the merrier" approach a step further, Nvidia now offers a four-GPU SLI setup (Quad SLI) that handles high antialiasing and anisotropic filtering settings in demanding video games. At the moment, Nvidia is keeping the reins pretty tight on Quad SLI; the new cards are trickling into boutique PC builders. Biohazard Computers is one of those select few, so I asked it to send *CPU* its very first Quad SLI system.

The Annihilation Quad SLI Edition uses a different case than the enclosure Biohazard's standard (SLI) Annihilation wore in our recent roundup (page 56, April 2006 *CPU*). This new case has a custom cooling setup: Four 80mm fans create a massive blowhole at the top of the case. The fans complement the slim fans attached to the two 1GB EVGA Nvidia GeForce 7900 GX2 cards.

The cards themselves make for an intimidating image when you peer through the system's large acrylic window. Each card has a second board that houses the second GPU. Although each card actually has two PCBs (Nvidia bolted them together), it doesn't require an extra slot. Biohazard CEO Josh Smith says that the company will soon have CardKeepers that will stabilize the cards during transit. That's good news, as my review unit's heavy cards visibly bent under their own weight.

Another particularly powerful component is the PC Power & Cooling Turbo-Cool 1KW power supply. It's a huge PSU, but the Annihilation's roomy lower chamber has space to spare. The Annihilation also includes a 2.6GHz AMD Athlon 64 FX-60 without the company's usual overclocking, as well as 2GB of OCZ Platinum DDR600 memory. Biohazard wrapped up the system with two 74GB 10,000rpm Western Digital Raptors and a 300GB Seagate 7,200rpm storage drive.

Annihilation Quad SLI Edition
$7,466.90
Biohazard
(866) 424-6727
www.biohazard-computers.com
●●●●

I like the Annihilation Quad SLI Edition's case. The Biohazard logo case mods add to the disaster theme without going over the top. Biohazard also puts enough lights into the system (two long, red, cold cathodes) to illuminate the entire system and cast a sinister red glow across your desk. Unfortunately, one of the cold cathodes fell from the system's ceiling. Sure, it's a small issue, but the last thing I'd want to do upon receiving my $7,466.90 gaming PC is whip out the Krazy Glue.

Although the Annihilation lacks the capacity for any extra hard drives, it has other upgrade possibilities. Of five 5.25-inch slots, three are free.

Nvidia's ForceWare drivers for Quad SLI are still maturing. I used version 87.25, which was the latest available. Quad SLI boosts the system's AA and AF capabilities, so I chose 8X SLI AA and 8X AF where possible. Note that SLI AA is different than standard AA. ForceWare lets you adjust both, but (at the moment, at least) you'll need to dig into the advanced settings to enable it. Andrew Fear, product manager, software, at Nvidia, says that upcoming versions will let you enable SLI AA easily. I also skipped the standard 1,280 x 1,024 resolution in favor of a 30-inch Dell 3007WFP's 2,560 x 1,600. (The monitor is not included in the price.)

The Annihilation's scores in our synthetic benchmarks weren't earth-shattering. However, the system ran these tests with the high AA and AF levels. The PC proved in our Dr. DivX and WinRAR tests that it's a very competent office machine.

The Annihilation posted 70.8fps in Far Cry's Research demo, which isn't bad for the high resolution, 8X SLI AA, and 16X AF. I also ran Far Cry's Training demo, which traditionally produces lower frame rates than Research. Here the system posted a still-solid 51.07fps. The Annihilation also posted 54fps in Quake 4. I turned off both AA and AF and turned on Soft Shadows in F.E.A.R. The system posted 50fps. The system handles graphics-intensive games well and produces smooth, natural images.

I suspect we'll see even better scores as Nvidia refines its drivers, but I don't have any complaints about the system's gaming capabilities now. The Annihilation will do your new 30-inch monitor justice. Biohazard's one-year warranty includes on-site tech support and 24/7 phone support. ▲

by Joshua Gulick

Benchmark Numbers

F.E.A.R. Soft Shadows On	50fps
Far Cry 8X SLI AA, 16X AF Research	70.8fps
Far Cry 8X SLI AA, 16X AF Training	51.07fps
Quake 4 8X SLI AA, 16X AF	54fps
3DMark06 8X SLI AA, 16X AF	3677
SM2.0	1494
HDR/SM3.0	1329
CPU	1927
PCMark05 8X SLI AA, 16X AF	5934
CPU	5305
Memory	4162
Graphics	5011
HDD	7129
Dr. DivX (minutes:seconds)	8:43
WinRAR (min:sec)	3:51

*All benchmarks run at 2,560 x 1,600

Specs: 2.6GHz AMD Athlon 64 FX-60, 2GB OCZ Platinum DDR600, Asus A8N32-SLI Deluxe, 2GB EVGA GeForce 7900 GX2 (x2 Quad SLI), Integrated ALC850, 1KW PC Power & Cooling Turbo Cool, Gigabit LAN, NEC ND-3540A DVD±RW, WinXP Pro

CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

ATI Radeon X1900 XTX vs. Gigabyte GeForce 7900 GTX
A Single-Card Slugfest

As much as we drool over the high-end, dream PCs that line the pages of *CPU*, the fact remains that little inconvenient necessities such as auto leases, mortgages, and tuition tend to stand in the way of actually owning or building such a rig for ourselves. The scrilla needed for a Quad SLI system will net you an Xbox 360, PS3, and a pretty sweet HDTV to boot.

But this isn't a PC vs. console gaming debate. We know that power users on a budget are the rule rather than the exception; at the same time, $500 to $600 will still buy a lot of graphics muscle. With that in mind, we wanted a direct comparison between ATI's and Nvidia's finest thoroughbreds: the Radeon X1900 XTX and GeForce 7900 GTX, respectively. We shunned SLI and cut CrossFire out of the equation for a single card bout. ATI's Radeon X1900 XTX stood in for the red camp, and Gigabyte's GV-NX79X512DB-RH started for the green team.

Both cards bring distinct advantages to the table. For example, the GeForce 7900 GTX's massive heatsink and simply enormous fan make it whisper quiet: Even with my open case and the card running under a load, my ears could barely discern any noise coming from the card. The Radeon X1900 XTX, on the other hand, sounded like an angry food processor when I started it, but it quickly quieted down. Still, I give the edge to Nvidia/Gigabyte for keeping the card cool without being too loud.

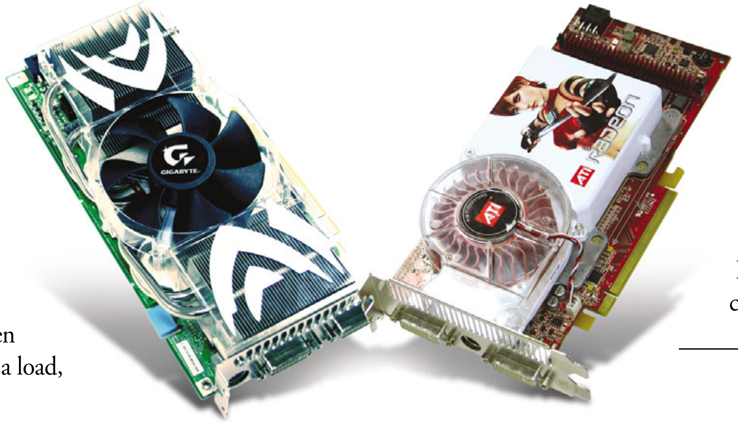
The Radeon X1900 XTX has a distinct advantage with 48 pixel shader units compared to the GeForce 7900 GTX's 24, but as we pointed out last month (see pages 37 and 38 of "Advanced Q&A Corner" for more information), this only gives the Radeon X1900 XTX a leg up when a game benefits from more available shader units.

However, enabling HDR and FSAA simultaneously is an advantage that Radeon X1K chips currently enjoy. Nvidia will eventually catch up in this arena, but you ought to notice a distinct difference in quality if you can patch your games to support HDR and FSAA.

With only AA and AF enabled, though, the Radeon X1900 XTX and GeForce 7900 GTX traded blows in all of our tests, but neither card emerged as a clear winner. Although both cards' overall 3DMark06 scores were very close, each claimed a victory in different Shader Model tests. The 7900 GTX emerged victorious in the SM2.0 test (2487 to 2244), while the Radeon X1900 XTX, not surprisingly, won the HDR/SM3.0 test (2586 to 2406).

My game tests told a similar story. When either card operates outside of SLI or CrossFire, picking a performance winner based strictly on frame rates is an exercise in futility. Unfortunately, I can't unequivocally exclude SLI and CrossFire from the equation. As it stands now, Nvidia has the edge in multirendering largely thanks to better driver support. ATI seems to have solved the availability problems that plagued the R520 launch, so there shouldn't be much difficulty getting your hands on either of these cards.

With at least one significant announcement on the very near horizon, it's not unreasonable to expect a price drop on one or both of these cards. Even though I really liked simultaneous HDR and FSAA on the Radeon X1900 XTX, picking either card is a smart choice. ▲



by Vince Cogley

Benchmark Numbers		3DMark06 v1.0.2 1,280 x 1,024			Far Cry 1.33 patch	Quake 4	F.E.A.R.
Graphics Card	Clock Speed	Overall	SM2.0	HDR/SM3.0	1,600 x 1,200 4XAA/8XAF	Custom Demo 1,600 x 1,200 4XAA/8XAF Ultra	1,600 x 1,200 4XAA/8XAF Maximum
ATI Radeon X1900 XTX	650MHz core; 775MHz memory	5749	2244	2586	86.49	59.4	40
Gigabyte GeForce 7900 GTX 512	650MHz core; 775MHz memory	5777	2487	2406	79.31	61.7	46

Test Specs: Intel Pentium D 840, Intel 975X motherboard, 1GB Corsair XMS2-6400 RAM

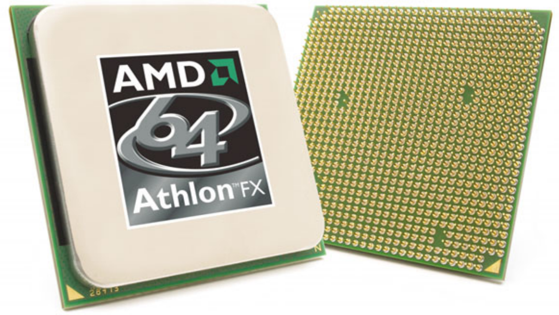
GeForce Specs: G71 GPU at 650MHz; 512MB of GDDR3 memory at 800MHz (256-bit bus); two dual-link DVI-I outputs; dual-slot cooling
Radeon Specs: R580 GPU at 650MHZ; 512MB of GDDR3 memory at 775MHZ (256-bit bus); two dual-link DVI-I outputs; dual-slot cooling

GeForce 7900 GTX 512
$499 to $549
Gigabyte
(626) 854-9338
www.giga-byte.com
●●●●

Radeon X1900 XTX
$599
ATI
(905) 882-2600
www.ati.com
●●●●

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●● 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

AMD Athlon 64 FX-62



AMD took a chance when it first brought dual-core technology into its hard-core gamer line. Unlike other FX processors, each of which offered a faster clock speed than the last, the FX-60 included two cores but came in 200MHz slower than the FX-57. AMD hoped that its customers would value the dual-core CPU's flexibility, and the switch paid off: The FX-60 remains a popular processor among high-performance users. In fact, AMD representative Damon Muzny says the "dual-core FX-60 is even more popular than previous single-core FXes."

The FX-60's success isn't all that surprising, as it quickly became the second-best gamer (behind the FX-57) in many games and added extra oomph when users turned to other applications. But with the FX-62, you won't sacrifice speed or flexibility. The FX-62 rolls in with a 2.8GHz clock speed and two cores, each of which sports a 128KB L1 and 1MB L2 cache.

The chip has two other particularly noteworthy architecture changes. The first is that the chip supports unbuffered DDR2 memory up to PC2-6400. (New Athlon 64 and Sempron CPUs will also support DDR2 memory, but only to PC2-5300, according to AMD.) Second, the FX-62 and AMD's other recently announced processors also introduce the AM2 socket, which requires 940-pin socket AM2-based processors.

AMD manufactures the FX-62 with the same 90nm SOI as the FX-57 at its Dresden, Germany, fabrication facility. Major board makers are already producing socket AM2 motherboards, so expect your choices to increase quickly. Asus and Foxconn are among some of the builders who already have socket AM2 boards available; both makers' boards sport Nvidia's nForce 590 SLI MCP. That said, Nvidia isn't the only chipset maker that will support the new socket; expect the usual suspects to also support it. As Muzny puts it, the FX-62 is "enthusiast friendly" (read: unlocked multiplier). You can expect the FX series to remain "enthusiast friendly" for some time.

My FX-62 review unit included the processor's standard heatsink, which is reasonably quiet and has copper heatpipes. My benchmarking rig also included an Asus M2N32-SLI Deluxe (Nvidia nForce 590 SLI MCP), 1GB of Corsair XMS2-8500 memory, and a 10,000rpm Western Digital Raptor WD740 hard drive. On the graphics end, I chose a 512MB Gigabyte Nvidia GeForce 7900 GTX. The motherboard can support dual-card SLI, thanks to an extra PCI-E x16 slot.

Not surprisingly, the system posted some strong scores in our benchmarks. It ran our video-encoding test in four fewer minutes than the FX-60 system and also posted a faster WinRAR 500MB compression time. The system's PCMark05 Score was no less than 6905.

The FX-62 clearly offers a performance increase over its older sibling, and with Intel's Conroe not yet in the picture, the FX-62 has some time to bask in the sun. Muzny says you can expect the AM2 socket and DDR2 memory to stick around for at least another couple years, but don't jump from an FX-60 just yet. The FX-60 has tons of life left in it, and you have plenty of time to get around to the big-time upgrade that the new processor requires. At $1,031, the FX-62 isn't wallet-friendly, and it's only the tip of the iceberg. By the time you load up your rig with a new high-end motherboard and a new set of memory (and perhaps the snazzy new Zalman CNPS9500 AM2 cooler that Nvidia is touting as "Optimized for Nvidia nForce"), you're looking at a pile of cash.

You'll also want to consider AMD's forthcoming release, codenamed 4x4. As you read this, AMD will have announced this new package, which features two sockets that support dual-core CPUs. Muzny says the double-dual-CPU setup will be in customers' hands in the second half of 2006. That said, you have plenty of fragging to do between now and then. And, of course, if you're on a single-core CPU, it's time to quit running on one leg. ▲

by Joshua Gulick

Benchmark Numbers

	Athlon 64 FX-62	Athlon 64 FX-60	Pentiumn Extreme Edition 955 Dr. DivX
(minutes:seconds)	7:59	12	12:10
WinRAR (500MB Compression)	3:43	3:52	3:42
PCMark05	6905	6212	5903
F.E.A.R. (1,024 x 768)	120fps	107fps	87fps
F.E.A.R. (1,280 x 960)	103fps	NA	NA

Specs: Dual-core; 2.8GHz, 1MB L2 cache x2; 128KB L2 cache x2; 128-bit DDR2 memory controller (dual-channel); 2GHz HyperTransport link; Socket AM2, 125W max thermal power; 90nm process

Athlon 64 FX-62
$1,031
AMD
www.amd.com
●●●◖

CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

AMD Athlon 64 X2 5000+

Whether you're planning to upgrade to the latest FX, Athlon 64, or even Sempron processor, you're looking at an entirely new platform. By the time you read this, AMD will have officially launched its AM2 socket, which replaces socket 939. AMD's Fab 30 in Dresden, Germany, is producing all of the AM2 processors, including the dual-core X2 and FX models.

I tested the Athlon 64 X2 5000+, which is the highest of several dual-core AM2-based processors. With the X2 5000+, AMD bumped the series' top speed to 2.6GHz. Each core has a 128KB L1 cache (64K instruction, 64K data) and a 512KB L2 cache. The chip also has a 2GHz HyperTransport link and a max thermal power of 89W, significantly less than the FX-62's 125W max thermal power. It also has a smaller die (183mm² to the FX-62's 230mm²) and far fewer transistors than the hardcore gamer CPU with 153.8 million.

AMD's adaptation of single-core processors to the AM2 platform signals that the chips certainly aren't has-beens just yet, but if you want to treat yourself, a dual-core processor, with its multitasking strengths, is the way to go. Of course, you're looking at more than a motherboard upgrade, as the 940-pin AM2 socket (finally) supports DDR2 memory. The single-core processors support DDR2 memory up to PC2-5300 officially, but the dual-core procs offer support for up to PC2-6400. And AM2 has a new heatsink tray, so expect to see a ton of air coolers that support these new processors. Some motherboards are already available for the new socket (expect to see plenty of boards that have two x16 PCI Express slots for SLI fun) and Nvidia's AM2-friendly nForce 500 series is getting attention. (We take a look at it on page 35.)

AMD also released the dual-core 3800+, 4000+, 4200+, 4400+, 4600+, 4800+, and 5000+ for the AM2 socket. You can find 939-pin counterparts for these models, save for the 4000+ and 5000+, which are AM2 only. On the single-core AM2 side, AMD offers the Athlon 64 3500+ and 3800+, as well as several Semprons (3000+, 3200+, 3400+, 3500+, and 3600+). AMD didn't produce an AM2 version of the FX-60; it starts with the FX-62.

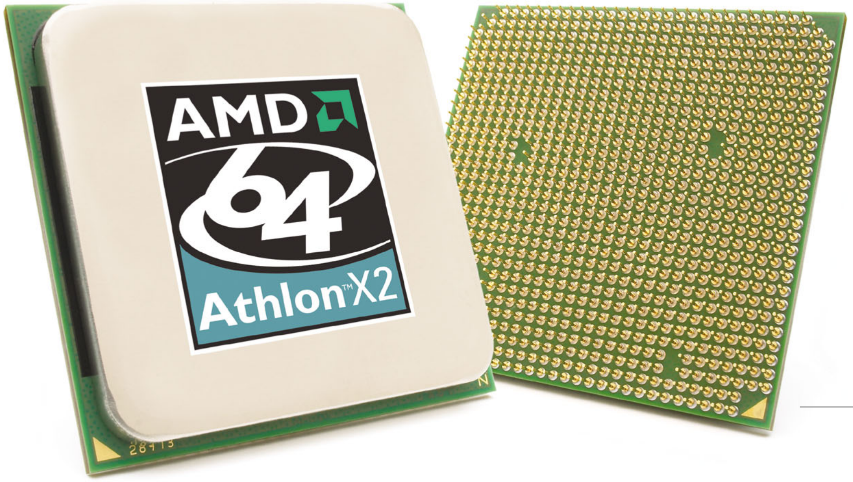
My benchmark PC included the Asus M2N32-SLI Deluxe motherboard, which has some great features, including two x16 PCI-E SLI slots and support for up to 10 USB ports, thanks to the Nvidia nForce 590 SLI MCP. Two of the four memory slots housed 512MB Corsair XMS2-8500 DIMMs, and one of the x16 slots had a 512MB Gigabyte Nvidia GeForce 7900 GTX. On the storage side, I opted for a single 10,000rpm Western Digital Raptor WD740.

Although I can't yet compare the X2 5000+ to an AM2 version of the X2 4800+, I can make some reasonable ballpark comparisons. According to AMD, the AM2 platform is likely to yield a 1% increase in performance for the 4800+ over the socket 939 model. I was surprised to find the X2 5000+ didn't offer much in the way of a frame rate increase from the X2 4800+ when I ran the F.E.A.R. graphics test. The new processor also crunched our 500MB test folder two seconds slower than the X2 4800+ (and didn't touch the Pentium Extreme Edition 955's 3:42 [minutes:seconds]).

However, the X2 5000+ creamed the older models when I encoded video with Dr.DivX, completing the job in only 8:40 to the X2 4800+'s 13:08. It also took PCMark05 by the horns with a 939-point lead over the older X2 processor.

Because AMD moved so many processors to AM2, you can enjoy the new platform without springing for the latest model. That said, you upgrade for better performance, and this processor provides it. At $696 X2 5000+ has a hefty price tag, but it's only $50 more expensive than the X2 4800+, so unless you're a gamer priced out of the FX-62 (or you are buying multiple processors in this range), the choice is a no-brainer. ▲

by Joshua Gulick



Specs: Dual-core; 2.6GHz; 512KB L2 cache x2; 128KB L1 cache x2; 128-bit DDR-2 memory controller (dual-channel); 2GHz HyperTransport link; Socket AM2; 89W max thermal power; 90nm process

Athlon 64 X2 5000+
$696
AMD
(408) 749-4000
www.amd.com
●●●◖

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●● 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

Asus PW191

A quick glance at the gorgeous PW191 16:10 widescreen LCD proves that Asus' engineers have a knack for designing slick, aesthetically pleasing monitors that will appeal to a mass audience. The PW191 features a beautiful, high-gloss black finish with a machined aluminum base and stand that complement the panel. Overall, I'd rate the Asus PW191 very high in a beauty contest, but I can't evaluate the PW191 on looks alone.

As its name implies, the PW191 is equipped with a 19-inch LCD. It has a native resolution of 1,440 x 900 with a 0.285mm dot pitch and 8ms response time (Tr+Tf). Other specifications include a maximum brightness of 330 cd/m², a 600:1 contrast ratio, and a horizontal/vertical viewing angle of 150/130 degrees. On paper the PW191's TFT-LCD seems like a winner, but in practice I was left feeling a bit underwhelmed. The PW191 features a glare-type panel that's highly reflective in certain lighting conditions. During testing I occasionally found myself repositioning the panel in an effort to eliminate reflections from a window beside me and a light above. Thankfully, the PW191's base makes it easy to tilt, swivel, or pivot the panel.

Image quality seemed good overall. There were no dead or stuck pixels on the screen, but even if there were, Asus' ZBD (Zero Bright Dot) warranty implies that the company will replace any panel that suffers from pixel defects. Colors were well-saturated, and the panel had good brightness; however, some tones and hues seemed slightly off, as they tend to be with LCDs equipped with a glare-type filter. Watching movies was pleasurable, but I did have to adjust the panel slightly to compensate for slightly pink flesh tones. A few fast-paced game tests revealed little ghosting.

The Asus PW191 is equipped with digital DVI and analog D-Sub video inputs, a 3.5mm headphone jack, and a 3.5mm audio input jack. The audio input feeds the monitor's integrated 2W speakers, which were surprisingly good, relatively speaking. ▲

by Marco Chiappetta

PW191
$369
Asus
www.asus.com
●●●◖

Specs: LCD: 19-inch widescreen; Native Resolution: 1,440 x 900; Aspect Ratio: 16:10; Dot Pitch: 0.285mm; Brightness: 330 cd/m²; Contrast Ratio: 600:1; Viewing Angle (H/V): 150/130 degrees; Response Time: 8ms (Tr+Tf); Inputs: DVI-D, D-Sub

Asetek WaterChill Xternal

Self-contained, external watercooling kits are becoming increasingly more common. The latest company to throw its hat in the ring is Asetek, the makers of the VapoChill phase-change line of coolers.

The Asetek WaterChill Xternal kit is targeted squarely at enthusiasts and overclockers who crave high performance. This kit includes everything necessary to completely water cool a system. The flagship model contains a total of three waterblocks: one for the processor and two for Nvidia- or ATI-based GPUs and virtually every popular motherboard chipset. All of the waterblocks feature clear, acrylic tops with thick, solid, polished copper bases. The WaterChill Xternal unit itself houses a high-quality 12V pump, a 160cm³ reservoir with a window to easily monitor fluid levels, a large Black Ice Pro radiator, and four 120mm low noise fans.

One of this kit's unique features is that an included software utility that interfaces with the WaterChill Xternal's chill control module though a USB cable can control it. The software gives users the ability to monitor temperatures and vital system statistics, adjust fan speeds, and regulate the pump. The WaterChill Xternal also features a slick, 20 characters LCD module on its front bezel that displays similar information.

I found the WaterChill Xternal to be relatively easy to install but not quite as easy as Corsair's inexpensive Nautilus 500. Performance, however, was somewhat better than Corsair's kit. The WaterChill Xternal kept an Athlon 64 4000+ overclocked to more than 2.7GHz running at or below 114 degrees Fahrenheit under full load, and it did so quietly. The WaterChill Xternal's four 120mm fans aren't silent, but overall they're quiet.

Asetek includes a 6-foot WaterChill Tube Set with the unit, along with a custom slot shield to feed the hoses and the power extension cable into a system. Also, Asetek includes all of the fittings and mounting hardware you need, along with some thermal compound and Anti Alga Fluid. ▲

by Marco Chiappetta

WaterChill Xternal
$389
Asetek
www.asetek.com
●●●◖

Specs: Dimensions: 4.01 x 7.17 x 18.9 inches (HxWxD); Weight (empty): 9.41 lbs; Pump Specifications: 7 to 12W, Qmax 1020l/hm, Hmax 240cm; Socket Compatibility: S478, LGA 775, S754, S940, S939, AM2

CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

Seasonic® Since 1975

Top in Efficiency & Silence

S12 ~ 330W, 380W, 430W, 500W, 600W

nVIDIA SLI READY

SLI Certified S12 - 500 & S12 - 600

Sleeve Cable

Cushion Fan

Double 120mm Balling

Increases Airflow, Cut Down Fan Noise

RoHS

80% Efficiency

High Reliabile CAP

ATX 3 IN 1 EPS BTX

Environmental Friendly Design, Conforms to WEEE & RoHS

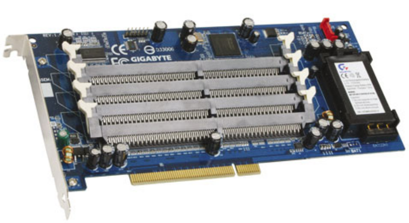
Super High Efficiency, Top Quality Components, Increase Product Reliability

Industrial Grade All in One Design, Support PC, IPC, Workstation, Server, and Dual CPU system (430W & Above)

ZipZoomfly.com newegg.com MICRO CENTER online DIRECTRON.COM pcalchemy The HTPC Store.

www.seasonicusa.com

Gigabyte i-RAM



Gigabyte has introduced i-RAM: a solid-state device that uses standard DDR memory and an open SATA port.

In a typical installation the BIOS recognizes i-RAM as a standard hard drive. The face of the card has four DIMM slots and a large lithium battery for backing up data.

For each testing setup, I made the drive(s) the primary boot device, installed Windows XP, and ran my benchmarks. I also rigged up a few scenarios: installation as a boot partition or game drive.

The i-RAM's performance made single drives look weak in comparison, and it bettered my RAID 0 setup in everything but burst reads due to the large cache on the hard drives. However, I couldn't install RAM with thick heat spreaders; thus, you'll need to consider the cost of i-RAM and a full allotment of new memory. Also, the paltry size of the memory the card supports prevents you from using it for much more than a single, large application at a time.

The price of the card and memory, combined with the i-RAM's relatively small capacity, may limit this product's appeal.▲

by Robert Maloney

Benchmark Numbers HD Tach 3.01

	i-RAM	Seagate Barracuda V	Western Digital SE16 250GB (2x Raid 0)
Random Access (milliseconds)	0	13.8	13.3
Burst Read (MBps)	139.6	95.9	266.6
Avg. Seq. Read (MBps)	132.6	36.5	102.1
Real-World Timings WinXP Boot Time (seconds)	i-RAM 32.4	Seagate Barracuda V 38.4	WD SE16 (Raid 0) 36.4
Far Cry Level Load (seconds)	26.3	34.7	33.0
PCMark05 Index Score	i-RAM 33067	Seagate Barracuda V 4277	WD SE16 (Raid 0) 7305

Specs: PCI 2.2 compliant, SATA connector, 4 DIMM slots, supports 4GB unbuffered DDR 200/266/333/400MHz, 1,600mAh lithium backup battery

i-RAM
$125
Gigabyte
www.gigabyte-usa.com
●●●●

Asus EN7900GT TOP

Video card releases used to be affairs surrounded by secrecy and anticipation. These days there's much less fanfare, as new card releases seem to be more the result of trying to stay fresh in the public eye than a real technological breakthrough.

Nvidia's introduction of the GeForce 7900 family was such a maneuver: a slight bump in clock speeds and some optimized architecture enough to keep potential buyers loyal to the cause. This new series consists of two types: the midrange 7900 GT (450MHz) and high-end 7900 GTX (650MHz).

Asus upped the ante with its EN7900-GT TOP. This card comes preoverclocked with a core clock of 520MHz and memory running at 1.44GHz. Unlike some more powerful cards (such as the GTX), the Asus card has a much slimmer profile with single-slot cooling that's hardly audible over other system components and a length about 2mm shorter than previous models.

Asus has also improved the EN7900GT TOP's performance over Nvidia's 7800 GT and ATI's X1800 XL. Frame rates in graphics-heavy games such as Quake 4 typically jumped as high as 30 to 40% faster when I used the Asus card. Using two cards in SLI was also highly desirable. Comparing the numbers using two 7900 GTs vs. two 7800 GTs showed less improvement.

Improved speeds make the EN-7900GT TOP a must-have because it offers excellent performance at an attractive price point. ▲

by Robert Maloney

EN7900GT TOP
$319
Asus
www.asus.com
●●●●◖

Benchmark Digits

	GeForce 7800 GT	SLI	Asus EN7900GT TOP	SLI	X1800 XL
3DMark05	6697	8201	7564	8390	7078
3DMark06	3488	5183	4400	5521	3384
SM2	1496	2479	2023	2515	1426
HDR	1485	2580	2007	3031	1448
*Fear 1.0.4	26fps	47fps	36fps	66fps	28fps
*Quake 1.2	36.1fps	67.4fps	47.6fps	77.5fps	26.8fps

*1,600 x 1,200; at 4XAA and 8XAF

Specs: GeForce 7900 GT; 256MB DDR3; Engine Clock: 520MHz; Memory Clock: 1.44GHz; PCI-E; Dual DVI-I

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

Philips Brilliance 230WP7

Philips latest LCD is called Brilliance for a reason: It's almost too bright and too big to sit very close to. The widescreen 16:9 format is great for viewing DVDs, and the 12ms response time will delight gamers and graphic designers all over.

I normally run half a dozen programs at a time, and on a 15- or 17-inch monitor, there's no way to view more than one full-sized page without overlapping windows. But it's a different story with the 230WP7. Having such a huge screen surface is wonderful for displaying a two-page spread from a desktop publishing program with plenty of additional room for displaying other windows, as well.

The monitor looks good and has an effective tilt-and-pan stand that supports it. I connected the monitor to several computers, and it performed flawlessly in either digital or analog modes, automatically presenting the best picture within a few seconds. My test unit had no dead pixels that I could see. Response was snappy, and after using it for a week, I found myself turning down the brightness level.

The monitor comes with two inputs: VGA and DVI. What's missing is a TV tuner that you can find on many other models of this size: This is strictly for computing. It comes with a four-port USB hub with connector ports that you can easily reach.

The monitor carries a list price of $1,500, but retailers are selling it for about $1,000. Dell's UltraSharp 2405FPW 24-inch widescreen LCD goes for less and includes a TV tuner, but it doesn't have the awesome 178-degree viewing angle the Philips 230WP7 does. ▲

by David Strom

Brillance 230WP7
$999
Philips
(877) 835-1838
www.philips.com
●●●

Specs: 1,920 x 1,200 pixels, 0.258 pitch, 700:1 contrast, 12ms response time, VGA and DVI inputs, 178-degree viewing angle, 4-port USB hub, 21.2lbs

Foxconn C51XEM2AA

Foxconn doesn't offer as many retail motherboards as, say, Asus, but it's a major player nonetheless. Foxconn is targeting this retail board at hard-core enthusiasts, so it loaded both the board and box with heavy-duty goodies. The board gets a six-layer PCB and AMD's new AM2 socket, plus DDR2 memory support.

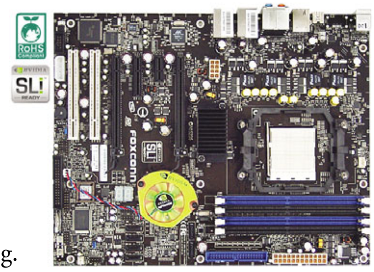
Nvidia's nForce 590 SLI MCP, the heart of the C51XEM2AA, provides RAID support for six SATA drives (including six-drive RAID 5). There's also support for up to 10 USB ports (six external, four internal) and two Gigabit LAN ports. The MCP also offers LinkBoost, which automatically detects video cards with certain Nvidia GPUs—that now just includes the GeForce 7900 GTX; LinkBoost detects the GPU whether you have one or more installed—to increase MCP HyperTransport and PCI Express speeds. FirstPacket, another new feature, offers gamers the freedom to transfer files online without sacrificing ping.

All this makes for a crowded board. The first thing I noticed about the board was the MCP, which sits directly behind the upper x16 PCI-E slot. The location demands a low-clearance heatsink, and the bundled bright-green and copper heatsink/fan barely fit. Oddly enough, the Debug LED sits just under the MCP, close to the lower card (in an SLI setup).

Another minor layout gripe is the floppy connector sits at the board's bottom, so you'll spend more effort routing the cable up to the floppy drive. The board's single IDE connector (yes, IDE is putting one foot firmly in the grave here) is right where you'd expect it, on the board's right side.

My C51XEM2AA unit, running on a 2.8GHz AMD Athlon 64 FX-62, crunched our 500MB test file (WinRAR) in just 3:37 (minutes:seconds). It also posted 124fps in F.E.A.R. at 1,024 x 768. You'll enjoy tinkering with this board's features and overclocker-friendly BIOS, whether you game or not. That said, less-adventurous users will appreciate the automatic features, such as LinkBoost, which automatically detected my 512MB Gigabyte GV-NX79X512DB-RH Nvidia GeForce 7900 GTX. ▲

by Joshua Gulick



C51XEM2AA
$250
Foxconn
www.foxconnchannel.com
●●●●◖

Specs: Socket AM2; chipset: Nvidia nForce 590 SLI MCP; max memory: 8GB of DDR2; audio: 8-channel HDA; LAN: Gigabit x2; slots: two PCI-E x16, one PCI-E x4, one PCI-E x1, two PCI

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●● 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT by Anand Lal Shimpi

AMD Introduces Socket AM2: I'll Tell You Why

As you've no doubt heard by now, AMD just recently launched its Socket AM2 platform. Overall, the new AM2 chips offer no tangible performance improvement over the previous socket 939 offerings; the model numbers and specs haven't changed, simply the pinout and the memory supported.

Socket AM2 brings DDR2 support to AMD for the first time ever, in the form of DDR2-667 support for the Athlon 64 and Sempron lines and DDR2-800 for the Athlon 64 X2 and FX series. Although DDR2-800 offers twice the theoretical bandwidth of DDR-400, the standard memory technology in socket 939 AMD processors, the real-world performance improvements are virtually non-existent. The biggest impacts I've seen are in non-GPU-limited 3D games, the performance improvement there being as much as 4 or 5%, but for the most part, you're looking at getting another percent or two at best over socket 939. If you've already got a good socket 939 system, there's absolutely no reason to upgrade. If, however, you are in the market for a new AMD system, there's no reason not to go with an AM2 platform, as the new AM2 CPUs are priced no differently from their socket 939 counterparts.

The lack of any performance boost on the new platform really boils down to the fact that the K8 architecture hasn't really changed over the lifespan of socket 939. The CPUs haven't gotten more data-hungry by becoming wider or more likely to prefetch data, so the need for more memory bandwidth just isn't there. The other factor is clock speed, or the lack thereof. AMD hasn't really increased clock speeds that much since socket 939 has been around. And although we've seen the introduction of dual-core processors, there are simply not enough bandwidth-hungry, multithreaded apps to stress more than the dual-channel DDR-400 memory controller on socket 939 CPUs. What it all boils down to is this: If the rate at which AMD's CPUs require data doesn't increase, either by way of much higher clock speeds or a more data-hungry architecture, then the requirement for a faster memory bus will also not increase. At the end of the day, dual-channel DDR2-800 simply isn't necessary.

AMD clearly didn't move to Socket AM2 for kicks and giggles, though. So what is going to happen in the future to increase the memory bandwidth demands of AMD processors to make socket AM2 worthwhile?

Sometime in 2007 AMD will introduce K8L, an evolutionary successor to the K8 architecture designed to compete with Intel's Core architecture. Many of the improvements found in K8L are similar to elements Intel introduced in Core, which not only lends credibility to Intel's Core architecture but also means that Core vs. K8L should be a very interesting matchup. The one item in K8L that we haven't heard about thus far is whether the chip will be any wider or if it will continue to be a 3-issue core. Because AMD's 3-issue K8 has always been a bit more flexible than Intel's 3-issue cores in the past, AMD may not see the need to move to a 4-issue design right away. Based on what has been announced thus far as being a part of K8L (i.e. speculative loads, increased SSE throughput), the architecture is going to be more memory bandwidth-hungry than current AM2 CPUs.

In addition to an update to its K8 architecture, 2007 should also see AMD introduce the first of its quad-core CPUs. With four cores on a single package and sharing a single memory controller, you better believe that memory bandwidth requirements are going to increase tremendously. Obviously the migration to quad core is very closely tied to AMD's move to 65nm, so we'll have to wait and see when this transition begins in earnest.

Socket AM2 is very much a "planning for the future" move for AMD, and thankfully AMD's recent track record has shown us that it is likely any socket AM2 board you buy today will have a solid upgrade path for future CPUs. One other important note: AMD's DDR2 transition couldn't have been timed better or executed more smoothly. One of Intel's biggest criticisms of AMD's on-die memory controller was that changing memory technologies would be very difficult, and with socket AM2 AMD has proved Intel wrong. Of course, maybe that's why Intel has been working on integrating a memory controller onto its own cores for the future. ▲

Talk back to Anand@cpumag.com.

Anand Lal Shimpi has turned a fledgling personal page on GeoCities.com into one of the world's most visited and trusted PC hardware sites. Anand started his site in 1997 at just 14 years old and has since been featured in USA Today, CBS' 48 Hours and Fortune. His site—www.anandtech.com—receives more than 55 million page views and is read by more than 2 million readers per month.

AMD clearly didn't move to Socket AM2 for kicks and giggles, though.

VANTEC

NexStar
External Enclosure Series

FOR 2.5"/3.5" HDD/5.25" DEVICE | USB 1.1/2.0/FIREWIRE/eSATA | PLUG N' PLAY

Store up to 500 GB

music data photo movie

*drive not included

Form and functionality collide with style in the NexStar External Hard Drive Enclosure series. From the mirror-finish Nexstar 3 to the USB ports integrated NexStar GX, the NexStar accommodate wide range of needs. Convenient storage, stylish design, SMART active/passive cooling system, and USB hub integration, NexStar optimize your storage device. Vantec's NexStar series is your ideal choice to take your 2.5' and 3.5' hard drive or DVD burner on the go!

newegg.com PCMall TigerDirect.com ZipZoomfly.com MicroCenter Fry's Outpost.com Directron.com

For more information on complete product line please go to **http://vantecusa.com/product-storage.html**

Copyright © 2006 Vantec Thermal Technologies. All Rights Reserved. All Registered Trademarks Belong To Their Respective Companies.

The Shark Tank

Physics 101

by Alex “Sharky” Ross

Disrupting Reuters’ newswire with a cheery Christmas greeting at age six, Alex “Sharky” Ross became an avid computer user/abuser, eventually founding popular hardware testing/review Web site SharkyExtreme.com. Exposing shoddy manufacturing practices and rubbish-spouting marketing weasels while championing innovative products, illuminating new technology, and pioneering real-world testing methods was just a front for playing with the best toys. The site acquired, he left in 2001. A London native and London School of Economics graduate, Alex currently overclocks/tunes Porsche 996 Turbos with www.sharkwerks.com when he’s not tweaking PCs.

We’ve all come to accept 3D graphics chips as part and parcel of any happy-go-lucky gaming PC. It’s been that way since the late ’90s. Other than 3dfx pioneering the technology and then going bye-bye, only to leave Nvidia (who gobbled up 3dfx for a small sum) and ATI to duke it out for the top spot, not much has changed. Chips keep getting smaller, more complicated, faster, and all sorts of nifty, new 3D features. Games look absolutely stunning by comparison to eight years ago, but the latest buzz on the ’Net doesn’t seem to be about graphics, and instead it’s about physics.

I vaguely remember some mumblings from a company named Ageia (which we may hear a lot more of in the near future) in 2002 that was pioneering a PPU (Physics Processing Unit) to add yet more realism to games of the future. Skip forward to today, and there are already a couple of board vendors (Asus and BFG) itching to release some hardware in the form of a PCI board. The chip, dubbed the PhysX processor, is built at TSMC and sports 125 million transistors. Boards will come with 128MB of GDDR3 memory. The technology on offer includes the company’s Universal Continuous Collision Detection (maybe those zombies won’t get stuck in doorways anymore?), Physical Smart Particle Technology, Complex Object Physics system, Scalable Terrain Fidelity, and Dynamic Gaming Framework.

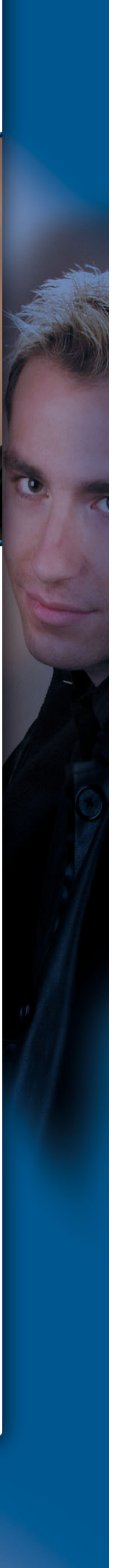
In case you thought game developers were not interested in physics, you’d be wrong. Think back to the days of SiN when even then first first-person shooters had some element of physics. You couldn’t exactly pick up a chair, sit down, and grab a paper and coffee back then, but you could at least throw that chair at the wall and have it shatter. Things haven’t moved along much further, to be honest, but game developers have always talked about adding more realistic physics and off-loading them to the CPU or GPU might not be all “that” anymore.

Where will this all go? Nvidia (teaming up with Havok) has already got its Havok FX technology holstered for future GPUs, so it must be serious. Clearly Ageia has a lot of work ahead in terms of gaining support for its API and getting its SDK out to as many developers as possible. Once in developers’ hands, we shall see what sort of content they can conjure; thus far the omens look good with games such as Unreal Tournament 2007 already onboard. Even Sony has already paid an undisclosed (rumored to be a princely sum) fee for full licensing for all of the upcoming PlayStation 3 games. Otherwise it’s about $50K a pop if you want Ageia’s SDK and full-level hardware support. Just to tinker with the SDK, however, it is actually free. So far, even the press was impressed by demos at this year’s Game Developers Conference, including Bet On Soldier, Hangar Of Doom, and Cellfactor, which made excellent use of smoke effects and loads of items of debris flying around. Particularly noteworthy were the sleek particle effects with fluids and flames, which made for interesting new weapons that physics could manipulate to go around corners.

For now it’s not exactly worth your money; unless, of course, you’re one of those “gotta have it now” early technology adopters (pointing at myself here). Right now you can play games such as Tom Clancy’s Ghost Recon Advanced Warfighter with a PhysX-based card and have more shrapnel than before fly your way. This is pretty neat the first couple of times you see it, but then what? For a better taste of what’s to come, download the Cell Factor demo, which requires a PhysX card in order to “control” objects that you can chuck around—if that means a grenade, be sure to duck for cover as shrapnel once again goes everywhere. It is obviously the early days yet, and there are not any full games out today that make the most of the PhysX card’s capabilities, but that could change. It did take a great deal of time for 3dfx and 3D graphics to kick off back in the day. ▲

We’ve all come to accept 3D graphics chips as part and parcel of any happy-go-lucky gaming PC.

Email me at sharky@cpumag.com



PC Modder

Tips & Tutorials

Modding does the body good. A PC's body anyway, inside or out. Here you'll find hardware, firmware, tools, tips, and tutorials for modding your rig's performance and appearance. Send us your own mod-related tips and ideas at modding@cpumag.com.

Modding enthusiasts have a penchant for the latest toys. Fast processors, powerful video cards, silent SFF enclosures, and radically lit motherboards are all fair game when it comes to a modder's creative mind. Recognizing the appeal of unconventional customization, an entire industry has emerged to support the community.

Mods & Ends

Thermaltake Eureka Home Server Case VC8000 SWA/BWA

Thermaltake may not market its Eureka VC8000 (SWA Silver or BWA Black) case to hard-core gamers and overclockers, but many of its features will likely appeal to a large portion of the enthusiast community anyway, including its cool arc shape. The full-tower ($159) is built almost entirely of aluminum, which enhances the case's thermal characteristics, and the case also has a pair of silent 17dB, 120mm intake and exhaust fans to keep air circulating inside. Additionally, the side panel features a honeycomb opening to further enhance airflow and circulation.

The Eureka's motherboard tray and external and internal 3.5-inch drive cages are removable, and the 5.25-inch drive bays also have sliding rails for easy drive installation. There are also seven expansion slots and preassembled mounts to accommodate hoses from a liquid-cooling system. The front and side panels lock for security, and the side of the case is equipped with USB 2.0, audio, and FireWire ports for easy access.

Thermaltake's all-aluminum Eureka Home Server case supports larger, extended ATX motherboards and has two 120mm fans.

Sunbeam Theta TP-101 Fan Controller

The Theta TP-101 ($33) is an add-in fan controller that lets you control system fans via a Windows-based utility. The Theta TP-101 supports up to eight fans at up to 10W max per fan. The TP-101 looks like a PCI card and mounts in a PCI expansion slot, but a USB port powers the unit.

The TP-101's bundled utility lets you tune individual fan-speed settings and save settings in separate profiles. For example, you can configure one fan profile for low-speed and silent operation and another for high-speed, overclocked situations. You can also schedule certain profiles to load at specific times, and the app lets you easily switch between different profiles with a few mouse clicks. The Theta TP-101 also gives you the option to set upper- and lower-boundary temperatures, thus regulating fan speeds automatically when those temps are reached. In this mode the fan speeds change linearly between 50 and 100%.

You can control up to eight fans via software with Sunbeam's Theta TP-101 Fan Controller.

Corepad Deskpad XXXL

Ever cursed and slammed your fists on your desk after missing a crucial shot in Counter-Strike because your mouse slipped off the mouse pad? Well, the Corepad Deskpad XXXL ($27) can help. The pad is essentially a giant, cloth surface measuring about 35 x 18 inches—large enough to cover a large portion of most desks. The Deskpad has a specially designed non-slip rubber backing that keeps it in place. The Deskpad XXXL is also washable using common dish soap and a sponge that's damp. Although the pad isn't exactly pretty, it also isn't ultra-slick like most hard mousing surfaces. Plus, you'll never run out of mousing space again.

The Corepad Deskpad XXXL turns nearly an entire desktop into a giant mousing surface.

Fashionably Fresh Firmware

Olympus E-500 Digital SLR Camera (v1.2)

Updated firmware for the Olympus E-500 adds a menu function for exchanging the AEL/AFL button and One-Touch WB button and improves the exposure precision when using the built-in flash.

www.olympus-europa.com

Pioneer DVR-111 Series DVD-R (v1.19)

The latest update for Pioneer's DVR-111 DVD recorder family adds support for new 8X and 16X DVD-R media from TMI, KingDisc, Postech, BeAll, Ritek, Optodisc, MBI, and others.

www.pioneer.co.jp

Leica Digital-Modul-R (v1.2)

This update for the Digital-Modul-R digicam improves compatibility with 4GB SD cards and Mac OS X 10.3, plus offers numerous bug fixes and optimizations.

www.leica-camera.com/index_e.html

by Marco Chiappetta

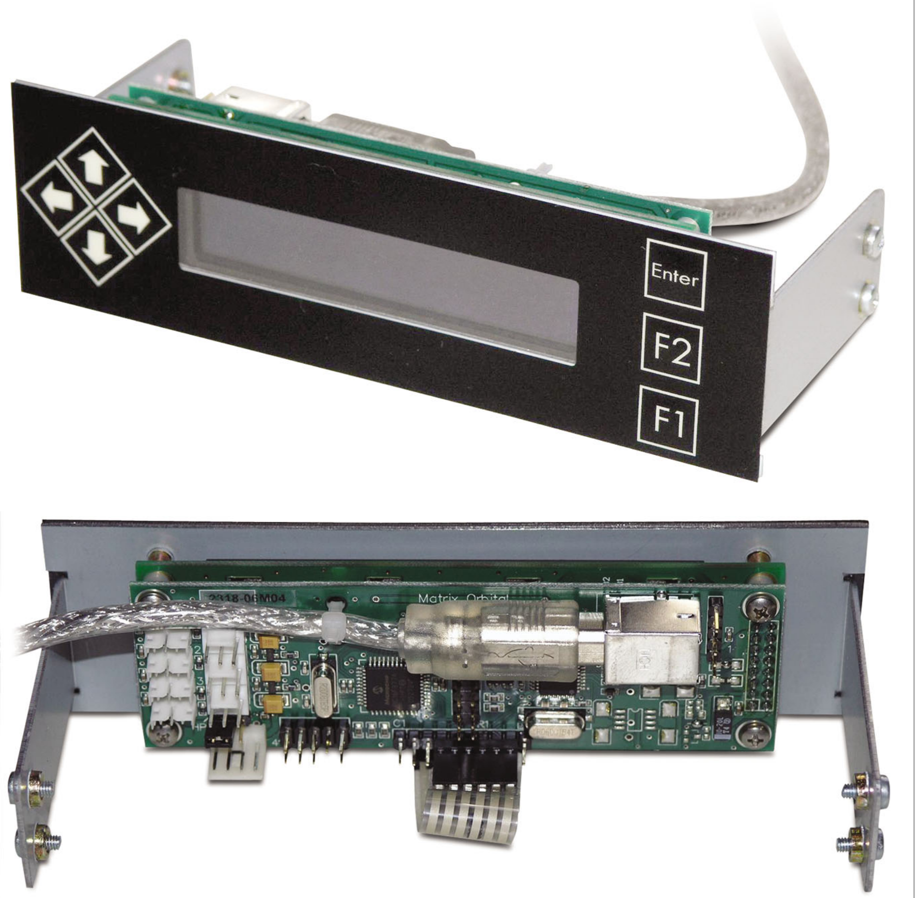
Enter The Matrix (Orbital)

A Mod That Puts Your System Data On Display

In an effort to differentiate their custom-built rigs from systems from generic system builders, boutique outfits such as Falcon Northwest, Alienware, and VoodooPC tend to incorporate unique accessories into their systems that you typically won't find elsewhere. Some systems have such characteristics as laser-cut, lighted panels that feature a wild logo, while others have killer paint jobs or even completely proprietary enclosures.

Another cool feature we recently encountered while evaluating VoodooPC's Omen a121x CrossFire Extreme Gamer PC was a slick PLED (polymer light-emitting diode) display that scrolled vital system statistics across its screen. Of course, an accessory such as this doesn't improve system performance, but we soon found ourselves constantly glancing at the PLED display to check what was going on with the system at any given time. The Omen's display detailed how much RAM a particular benchmark was using, how much drive space was available on each partition, and such simple things as displaying the current time. Overall, the PLED display came in quite handy.

When we eventually had to send the Omen system back to VoodooPC, a funny thing happened: We began glancing at our own system looking for PLED-display information. After a few hours of fruitless searching, we decided it was time to take action and incorporate a custom display into our own system to end the frustration once and for all.



You can program the Matrix Orbital MX610 we used for this project to display a wealth of information about its host PC. The MX610 can also power three case fans and monitor data from four thermal probes.

The Parts

A bit of research revealed that VoodooPC used a display from Matrix Orbital for the custom display it incorporated into the Omen a121x. If the display is good enough for Voodoo, it's good enough for us. Thus, we pointed our browser toward Matrix Orbital's Web site and ordered a premium MX610 kit. We also picked up a handful of Dallas One-Wire thermal probes.

Along with the PLED display, the MX610 kit includes a proprietary PCB that's equipped with numerous general purpose outputs you can use with case fans or other 5V/12V equipment. The PCB also included four inputs for thermal probes. Although the MX610 can monitor system data using Motherboard Monitor, the standalone thermal probes are useful for monitoring temperatures from items not listed in Motherboard Monitor, such as RAM or a GPU, for example.

Put It All Together

Assembling and installing the Matrix Orbital MX610 kit was a multistep process. Before actually inserting the unit into an available drive bay, we first connected the four Dallas One-Wire thermal probes to the four inputs on the MX610's PCB. Connecting the probes required nothing more than sliding a plug into a receptacle, but you do need to pay attention to which

We connected four Dallas One-Wire thermal probes to the MX610 to monitor temperatures that the included software couldn't monitor.

input you connect each probe to and label the probes accordingly. This will make sorting out temperature data much easier later on. If you button up your rig without keeping track of each thermal probe, it'll be difficult to figure out from where the probe is getting its temperature data.

After connecting the thermal probes, we fed all the wires into an available 5.25-inch drive bay and secured the MX610 in place with a couple screws. Some system cases, such as the Silverstone Temjin TJ03 we used for this project, have a tool-less locking mechanism to lock a drive in place. Most of these tool-less locks won't properly mate with a smaller device such as the MX610, so be prepared to remove these locks or force a couple of screws into place if needed. Luckily for us, the screws that Silverstone used to hold the locking mechanism in place lined up perfectly with the mounting holes on the MX610. With the screen mounted securely, we affixed the thermal probes to various components within the system. We attached one probe to the RAM, another to the back of our video card's GPU, another to our motherboard's northbridge, and the last one to the front of the PSU to give us a case-temperature reading.

The last thing we did was route the MX610's USB cable through an available slot cover and connect it to an open port in our motherboard's I/O backplane. Matrix Orbital also offers an internal USB connector cable for use with the MX610, but this would have required an additional purchase that we didn't think was necessary. If you opt for the internal cable, you'll need your motherboard manual handy to refer to the board's USB header pin configuration.

With everything mounted and connected, we powered up our machine and installed the necessary drivers for the MX610. The driver installation is automatic if you have the included CD in a drive when booting up the system. Windows will prompt you that it has

Installing the MX610 hardware is as easy as inserting it into an available 5.25-inch drive bay, tightening a few screws, and connecting a USB cable. Configuring the software is another story, however.

Parts & Prices

All the parts we used for this mod except one came directly from Matrix Orbital. The company's MX610 kit included a copy of LCDC and a 3-foot USB connector cable, but we had to purchase the Dallas One-Wire thermal probes separately. The prices for the equipment were:

- Matrix Orbital MX610: $109.95
- Thermal Probes ($9.95 x 4): $39.80
- **Total Cost:** $149.75

---

found new hardware, at which point it will scan for the CD and install the drivers.

Control & Configuration

Physically installing the Matrix Orbital MX610 couldn't have been much easier. Installing and configuring the software, however, was much more difficult. The MX610 bundles a third-party application called LCDC. Installing LCDC was the same as installing any other application—run the setup file and follow the on-screen instructions to register and activate—but difficulties came up when it was time to customize the data we wanted to display on the MX610's screen.

Upon completing the installation, LCDC launched and loaded a default configuration script that scrolled various data across the MX610's screen. The default configuration script was actually quite complete, but we wanted to personalize our installation with the data that our thermal probes would collect, plus we wanted to take advantage of the plethora of plug-ins available online for LCDC.

Using LCDC's plug-ins was relatively simple. After downloading the files from LCDC (www.lcdc.cc), we extracted them to a folder named Plug-ins in the installation directory. To register the plug-ins, we had to stop the display by pressing the top button in the interface and clicking the Configure/Test button. Each time we clicked the Configuration/Test button, the program scanned the plug-ins folder for new additions. We installed a couple of plug-ins for Nero and Folding-@Home that displayed usage statistics for each application.

Next, we had to configure LCDC to recognize our thermal probes. To do this we had to stop the screen again, enter the Configure/Test menu, and navigate to the program's advanced features section. Here, we highlighted the Dallas One-Wire menu option and ran the wizard to scan for connected probes. LCDC immediately recognized all four of our Dallas One-Wire probes, at which point we had to assign a name to each probe.

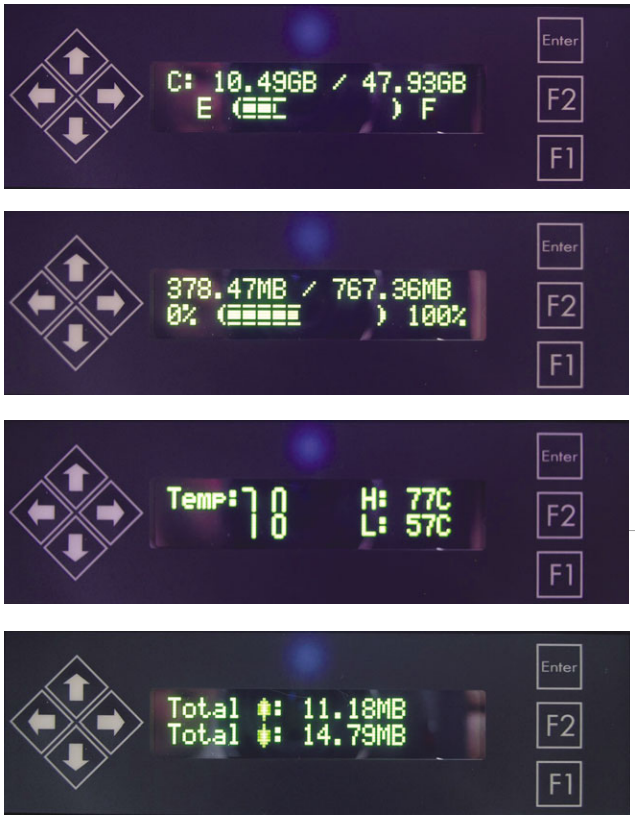
With our thermal probes registered in the LCDC application, we then entered the included Screen Builder utility and created an entry for each probe to actually get the data from the probes to the MX610's screen. In the screen builder menu, we first created a new entry in the existing script. We could have started with a clean slate, but there were already some useful items listed in the default script, so we decided to modify the included file instead of starting from scratch. Prior to creating a new entry, we had to assign it a name, duration time, FPS rate, and transition. We then had to individually configure how each line would display on the MX610's two-line screen using a combination of simple text and data variables gleaned from LCDC's text-definition variable screen. The process is somewhat tedious and more difficult than it needs to be.

After working with LCDC a while, it became apparent that a hard-core coder designed the utility from start to finish. This can be a good thing sometimes, but when a hard-core coder also designs the user interface, the interface can end up being relatively difficult to use. A typical line we saw displayed nothing more than a label and a temperature on the MX610's screen, such as: Case Temp: [#$AdvDalVal000]. That's hardly something a less-savvy user would be comfortable working with. Luckily, there is plenty of help available online at LCDC and Matrix Orbital's support forums.

Information Overload

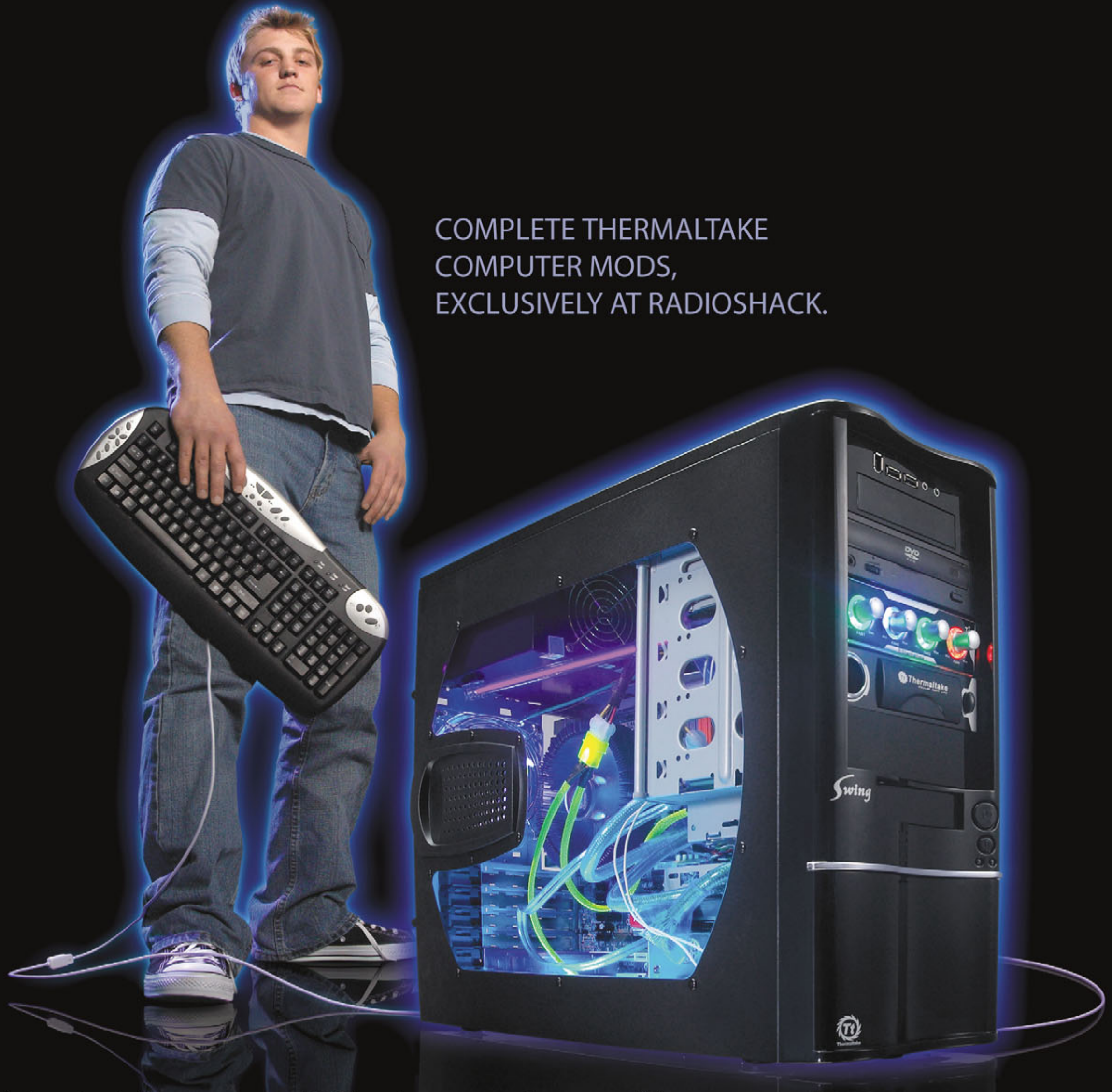
After completing the mod, our rig has a slick PLED display that scrolls myriad information about the system across its screen, just like VoodooPC's Omen a121x CrossFire Extreme Gamer PC. When all was said and done, available drive space and RAM; Internet-usage, Nero-burn, and Folding@Home stats; and a ton of other data was only a glance away. ▲

by Marco Chiappetta



With the Matrix Orbital MX610 installed, various data scrolls across its screen, including such things as local weather, drive and memory usage statistics, and network activity.

LET THE
MODNESS
BEGIN.



COMPLETE THERMALTAKE
COMPUTER MODS,
EXCLUSIVELY AT RADIOSHACK.

Here's how to shake up your next LAN party or computer competition.
New Thermaltake Computer Modding Components, coming soon to RadioShack.
A collection of cool lights, cables, fans and more that let you totally trick out your CPU.

So don't settle for the same old boring box.
Bust out with some serious PC bling from Thermaltake, at RadioShack.

RadioShack will be the exclusive retailer of the complete line of Thermaltake Computer Modding Products. Go online to RadioShack.com and see the complete line of Thermaltake, or to find a participating RadioShack store near you.

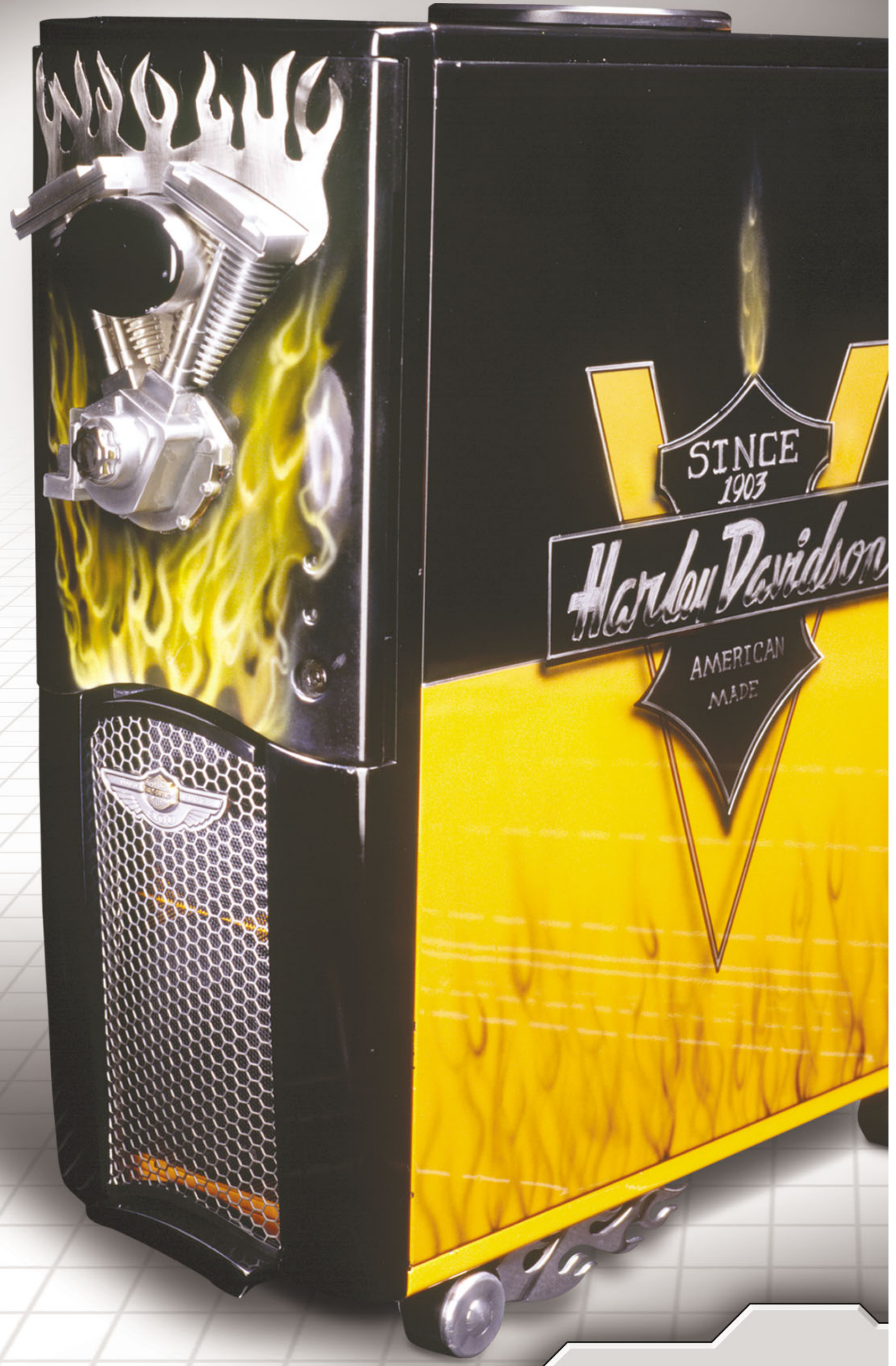
www.thermaltakeusa.com

Thermaltake Technology Co., Ltd.

RadioShack®

Mad Reader MOD

The HD-1: Born To Be Harley-Davidson



Bill Owen built a career (and a company) on his PC-modding talents. His modding service, MNPCTECH, creates some of the slickest custom cases on the planet. (We ought to know; Owen built the jaw-dropping "*CPU* Stingray" that graced the cover of our August 2005 *PC Modder 2.1*.) If you're thinking of taking your mod skills pro, meet your competition.

This tribute to Harley-Davidson and Chieftec's venerable Dragon case series features a 3.2GHz Intel P4 CPU, a DFI 925X-T2 P4 motherboard, 2GB of Corsair DDR2 memory, a 256MB ATI Radeon 9600XT, and dual 160GB Seagate Barracuda hard drives. Owen wasn't satisfied with the Dragon's four 80mm fans however, so he replaced them. "I've always wanted to modify the Chieftec Dragon chassis to accept two 120mm cooling fans in the front and two 92mm cooling fans in the rear," Owen says.

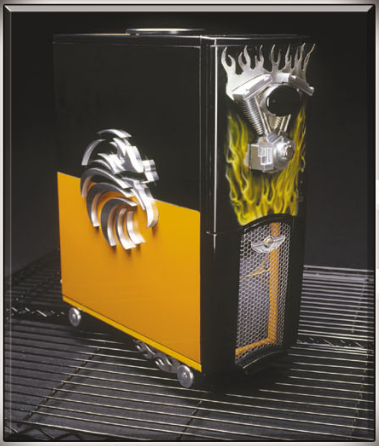
Owen's HD-1 also sports a custom blowhole, an aluminum eagle head, flaming wheels, and a backlit acrylic Harley logo, among other mods. Although Owen cooked up the HD-1's mods, the PC also owes its fiery exterior to MNPCTECH's airbrush artist, Lin Anderson. "I like the Createx because it's water-based [airbrush] enamel and flows with the best of paints," says Anderson. "Flow is very important because I freehand just about everything I do."

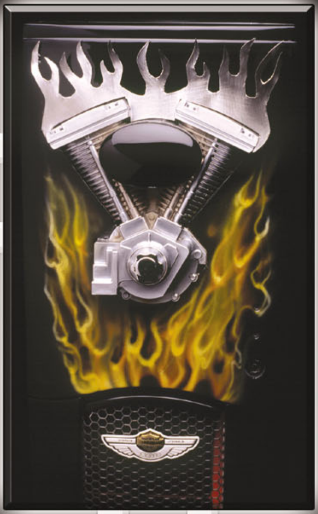
Anderson created the system's flames from layers of orange, white, and yellow paint, as well as a Createx Candy Orange layer. "The Candy really gives the fire the realistic feel and depth," Anderson says.

We know we wouldn't want to ever part with this show-stopping PC, so we weren't surprised to learn that Owen is keeping it in the family. The HD-1 now sits on a cherry wood desk in his parents' home. ▲

by Joshua Gulick

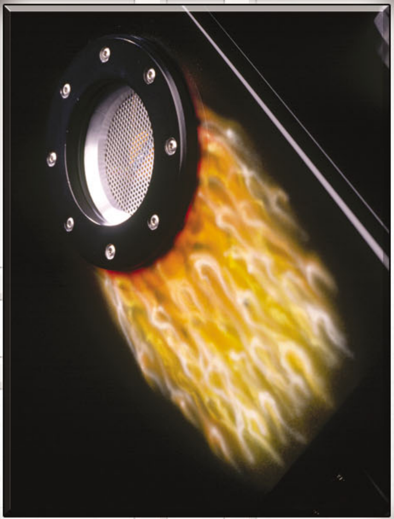
photos by
In Foto Minneapolis, Inc.
Scott Wojahn



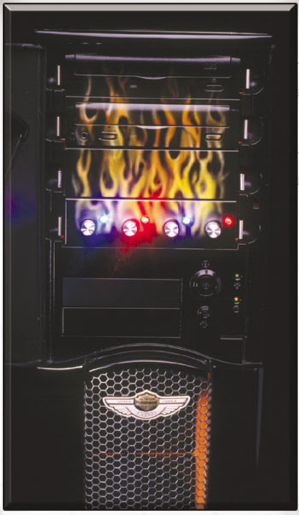


"The V-Twin engine is an old trailer hitch cover I found," says Owen. "I polished the cylinder heads by hand. I then smoothed over the bezel with fiberglass filler so the engine was recessed into the door." Owen used a Dremel to create the metal flames.

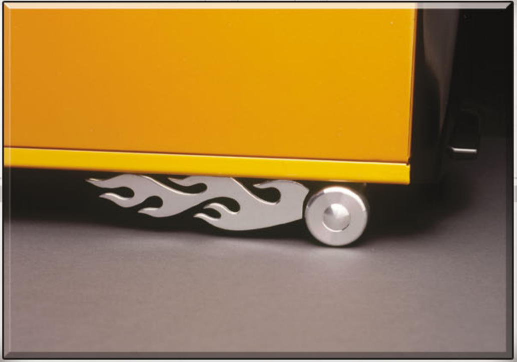
The water-cut eagle head silhouette gives the HD-1 some attitude, and it beats a side-panel window hands down. "Installing case windows is the majority of work I've performed for customers," says Owen. "In my opinion, the market has become oversaturated with premodified window cases. I'm no longer excited about a case window unless it's something that's never been done before."



Owen designed the blowhole at the top of the HD-1 to resemble a cap for a motorcycle gas tank. The 92mm fan has a matte-black powdercoat finish.



Lin Anderson, MNPCTECH's airbrush artist, added flames to the drive bezels. The HD-1 also sports Sunbeam's Rheobus fan controller.



As much as Owen likes the Chieftec Dragon, he didn't feel that its feet fit this system. The modding guru solved the problem by adding wheels from Lian-Li's V1000 case and then created the flames from aluminum.

Give Us Your Mod

Have a computer mod that will bring tears to our eyes? Email photos and a description to madreadermod@cpumag.com. If we include your system in our "Mad Reader Mod" section, we'll send you a $1,500 Newegg.com gift certificate and a one-year subscription to *CPU*.

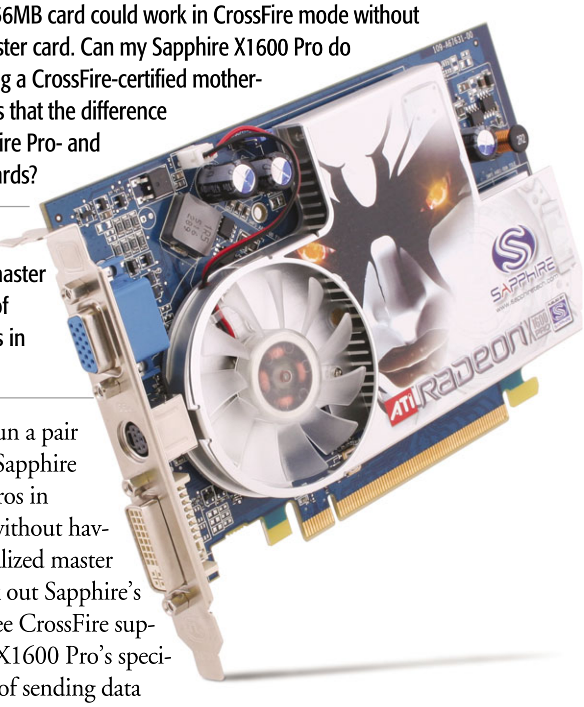
advanced Q&A corner

Get informed answers to your advanced technical questions from *CPU*. Send your questions along with a phone and/or fax number, so we can call you if necessary, to q&a@cpumag.com. Please include all pertinent system information.

> “You’re most likely witnessing Intel’s Pentium 4 (M) power management feature called SpeedStep.”

Each month we dig deep into the mailbag here at CPU *in an effort to answer your most pressing technical questions. Want some advice on your next purchase or upgrade? Have a ghost in your machine? Are BSODs making your life miserable?* CPU*’s “Advanced Q&A Corner” is here for you.*

Josh R. asked: **I’ve just finished building a brand-new system, and with it I got a Sapphire Radeon X1600 Pro 512MB PCI Express video card. I want to keep the 512MB card, but I recently read a review that said an Asus EAX1600XT 256MB card could work in CrossFire mode without having to use a master card. Can my Sapphire X1600 Pro do the same if I’m using a CrossFire-certified motherboard? And if not, is that the difference between the Sapphire Pro- and Asus XT-branded cards?**



You don’t need a CrossFire Edition master card to run a pair of Radeon X1600 Pros in CrossFire mode.

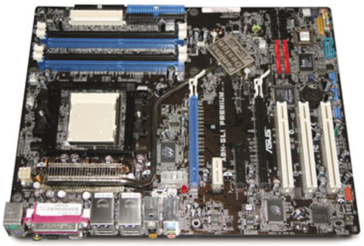
A: Yes, you can run a pair of those 512MB Sapphire Radeon X1600 Pros in CrossFire mode without having to use a specialized master card. If you check out Sapphire’s Web site, you’ll see CrossFire support listed in the X1600 Pro’s specifications. Instead of sending data from one card’s DVI output to the compositing engine on a master card as the X1800 and X1900 series do, ATI’s low- and midrange X1K family of products send frame data via the PCI-E interface to enable CrossFire. To answer your other question, the only differences between a Radeon X1600 Pro and an X1600XT have to do with core and memory clock speeds. The XTs are usually clocked much higher than the Pros.

However, we wouldn’t recommend running a pair of X1600 cards in CrossFire mode; it doesn’t make much sense for most users. Unless you need to connect more than two monitors to your system at one time, a faster, single card would probably better serve you. If you install a single card in your system, you won’t have to worry about whether your favorite game is going to scale with CrossFire, and it’s likely that the strain on your power supply would be lower, too. For about the same price as a pair of Radeon X1600 Pros, you could pick up a Radeon X1800 GTO, which offers as good or better performance in the majority of circumstances. For a few more bucks, you could get your hands on a 256MB Radeon X1800 XT, which is faster still. Unless you're spending big bucks on a high-end dual-GPU configuration that's quicker than any single card, it's usually easier and more cost-effective to stick with one fast card.

Mike M. asked: **Friends and family often call on me to help build or select a computer for them. Unfortunately, I made a mistake recently that I'm hoping you can help me with. I knew that the original version of the Asus A8N-SLI motherboard had two physical x16 PCI-E slots that actually ran at x8 in SLI mode. (Of course, there's a newer version capable of true dual x16.) I was building one system for a friend and recommending components for another friend that both had similar builds in mind. I saw a review of the A8N-SLI Deluxe that mentioned it ran dual x8 in SLI. By my own stupidity, I somehow concluded that the A8N-SLI Premium must be the board with the true dual x16, but it was really the A8N32-SLI Deluxe that I was after. I recommended the A8N-SLI Premium. Both friends bought it and are now stuck with a board that splits the bandwidth into two x8 for their SLI configurations. Can you please help me with two questions:**

1. **Is there an available BIOS update or hardware mod that could give the A8N-SLI Premium the dual x16 PEG capability of the A8N32-SLI Deluxe?**
2. **At what point will the dual x8 functionality create a bottleneck in my friends' SLI configurations? Are there any cards available today that are capable of delivering more data than that configuration can handle? I seem to recall seeing somewhere that a pair of Nvidia 6800 GS cards would be fine in that setup, but would the cards end up choking a pair of 7800 GTX's or 7900 GTX's?**

A: Unfortunately there's no modding firmware or software patch that can take a motherboard based on Nvidia's nForce4 SLI chipset and let it provide the extra PCI-E lanes Nvidia builds into its nForce4 SLI x16 chipset, which the Asus A8N32-SLI Deluxe is based on. The Asus A8N32-SLI Deluxe has 32 PCI-E lanes dedicated to dual x16 PEG slots in any configuration, whereas the A8N-SLI Premium only has 16 PCI-E lanes set for graphics in its chipset, which it then divides into a pair of x8 connections in each PEG slot when running in SLI mode. There's nothing you can do to change that; it's the hardware makeup of each chipset.



Asus' A8N-SLI Premium motherboard is based on Nvidia's nForce4 SLI chipset that runs in a dual x8 PEG configuration in SLI mode.

To follow up on your second question, a pair of x16 PEG connections in Nvidia SLI mode only have limited performance advantages over a pair of x8 PEG connections in SLI. Even Nvidia's latest GeForce 7900 series GPU offering won't be able to saturate the available bandwidth of x8 PCI-E links in single GPU or SLI dual GPU mode. There are fringe application scenarios, however, that do show very modest gains (~5%) for dual x16 PEG connections in SLI; for example, Nvidia's high-end SLI AA modes in certain game engines show slightly better frame rates on an nForce4 SLI x16 chipset-based board compared to the x8 PEG connections on a standard nForce4 SLI motherboard. This is mainly due to the higher bandwidth available for inter-GPU communications with load balancing, but the net gain is minimal. In general the Asus A8N-SLI Premium boards you recommended to your friends are more than capable of accommodating any multi-GPU configuration they could throw at them. Perhaps when Nvidia takes Quad SLI to more of a broader market later this year, a pair of full x16 PEG links will become important, but even then it will only be in those extremely high-end usage models and system configurations that 98% of end users don't bother to invest in.

Alex asked: **I have a Compaq Evo N800c notebook with a Pentium 4 (M) processor that's supposed to run at 1.6GHz. I have done a lot of tests on the clock speed of the CPU, and they all show the same clock speed: 1.2GHz. I called Compaq, and the company didn't understand what I was seeing either. Why is the processor running like this, and is there any way to fix it? I can't get into the BIOS because I think Compaq locked it.**

A: You're most likely witnessing Intel's Pentium 4 (M) power management feature called SpeedStep. We'll have to assume that you were taking these readings when running in battery mode rather than plugged into a wall outlet. What happens in battery power management mode with SpeedStep is that the processor automatically drops down to about 80% of its top clock speed. In your case the top-end 1.6GHz CPU clock speed drops down to 1.2GHz. We'd suggest performing the following test to see if you're getting the performance you should from this particular notebook.

First, plug the machine into a wall outlet so it's in maximum performance mode and then install and fire up a utility such as Prime95 (www.mersenne.org/freesoft.htm) or Folding@Home (folding.stanford.edu/download.html). Both of these utilities will heavily tax the CPU and keep it from throttling back into power-saving mode. Next, while Prime95 or Folding@Home is running in the background, start up a utility such as CPU-Z (www.cpuid.com/cpuz.php). CPU-Z is a good, quick diagnostic program that will report various clock and bus speeds in your system. Our guess is that you'll see your CPU has scaled back up to its full-throttle clock speed, and the clock CPU-Z reports back is in fact 1.6GHz. This dynamic clock throttling feature is critical to extending battery uptime of your notebook when you're truly going mobile with it. Without it you'd be complaining to Compaq about the machine's dismal battery life. Rest assured though, what you're seeing for clock speed is most likely by design and not some sort of defect or malfunction in the system. Frankly we're surprised the techs at Compaq didn't inform you of this, but then again that's why we're here. ▲

by Dave Altavilla and Marco Chiappetta,
the experts over at HotHardware.com

For bonus content, subscribers can go to
www.cpumag.com/cpujul06/q&a

UEFI

Make The BIOS Better

Working behind the scenes, your computer's BIOS handles the time from when you push the power button until the operating system loads. The BIOS has been performing this task, with very few core changes, since the earliest days of DOS and IBM's first PCs. But now industry developers say it's time for an upgrade.

UEFI (Unified Extensible Firmware Interface) is a specification that will eventually replace the BIOS or at least it will *appear* to replace the BIOS. UEFI actually will sit on top of a traditional BIOS; it won't completely replace the BIOS. A computer still needs the BIOS to perform basic tasks.

UEFI's History

UEFI serves as an interface between the PC's OS and firmware. Both the BIOS and UEFI fit into the PC firmware classification; although, the UEFI Forum says UEFI is a firmware interface specification, not a firmware implementation.

Throughout its history the BIOS has controlled the system between the time the user powers on the PC and the OS takes control. Now UEFI will perform much of the work of the BIOS, including standardizing the method for loading the OS and for running applications that are part of the boot process. UEFI will make booting to new hardware technologies and large storage devices much easier than with the BIOS alone.

The UEFI Forum released the UEFI 2.0 specification this past January, which should help lead to more widespread use of the interface. The UEFI 2.0 specification is based on the EFI 1.10 specification. Intel originally created the EFI specs for the Itanium server market and then contributed its EFI specs to the UEFI Forum, which now manages the changes to the specs and issues licenses. (Intel maintains its copyright on EFI 1.10.) By placing the 2.0 specification under the UEFI Forum, this lets numerous companies contribute to the specification and allows for broad adoption.

In all aspects of the computing market, including desktops, notebooks, and servers, UEFI should lead to more stability. Almost "hiding" the BIOS firmware from the OS, UEFI will regulate the way the firmware interacts with the OS. Also, UEFI will standardize traditional BIOS tasks, such as checking for installed hardware and loading the OS, resulting in fewer hardware conflicts and problems.

Key Differences

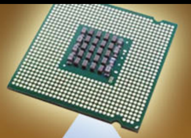
Clearly UEFI is designed as an improvement over the BIOS. Developers originally created the BIOS for the PC XT

How The BIOS Works

Here's a general look at how the BIOS in your computer works. (Keep in mind that each BIOS is a little different, so these basic processes might differ from your computer's BIOS.)

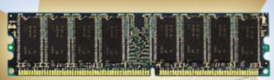
The CPU accesses the BIOS, which is a small chip on the motherboard that contains a set of instructions in ROM for booting the PC. The CPU reads those instructions and executes them, accessing data from areas on the BIOS chip or elsewhere in the computer.

Instructions in the BIOS continue to run the PC during the boot process until the BIOS hands off control to the OS.



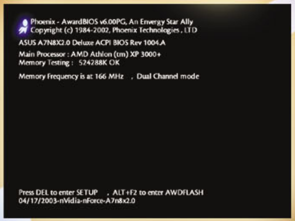
The BIOS reads data from the CMOS chip. CMOS contains data in RAM that includes information about your system.

The BIOS loads the device drivers and sends signals to the hardware, using data found in CMOS, to enable each component and to ensure CMOS lists each correctly. (A few examples below.)



Is amount of memory correct? Are all RAM chips working?

Does the keyboard respond to requests? What type of keyboard is it?



```
Phoenix - AwardBIOS v6.00PG, An Envergy Star Ally
Copyright (c) 1984-2002, Phoenix Technologies , LTD
ASUS A7N8X2.0 Deluxe ACPI BIOS Rev 1004.A
Main Processor : AMD Athlon (tm) XP 3000+
Memory Testing :  524288K OK
Memory Frequency is at 166 MHz   , Dual Channel mode

Press DEL to enter SETUP    , ALT+F2 to enter AWDFLASH
04/17/2003-nVidia-nForce-A7n8x2.0
```

The BIOS performs the POST: a multistep process that examines and tests system components.

As the final step of the POST, the BIOS finds a bootable disk (usually the hard drive) and then reads the first sector of the disk called the boot record. The boot record contains the OS loader software, which loads the OS.

The Job Of The BIOS

The BIOS performs three key functions:

- It determines whether all of the attached hardware devices are working properly.
- It loads the important parts of the OS from the hard disk or the network into memory.
- It manages the preboot data flow between the OS and the attached devices.

and PC AT computers more than 20 years ago. Computers today are vastly different than they were two decades ago obviously, but the essential aspects of the BIOS have changed very little in that time frame.

The BIOS also is exclusive to the x86 processor's architecture, whereas UEFI isn't exclusive to any type of processor architecture. When the BIOS loads, it must emulate old 8086/8088 Intel processors, which severely limits memory allocations. Another problem with the BIOS is its inability to effectively deal with large numbers of hard drive partitions. UEFI allows for far more efficient multibooting and use of multiple partitions.

Even though UEFI is the first significant, widespread change to the PC firmware since the creation of the BIOS, there have been many add-ons. UEFI makes use of a few firmware interfaces that were third-party add-ons to the BIOS in the past. The boot manager, for example, allows for booting from different devices or for toggling among OSes.

However, UEFI offers no specifications for handling the POST or Setup functions. Those functions remain with the BIOS, which is why the UEFI serves as an interface that runs on top of the BIOS.

UEFI provides a clean interface between the computing platform and the OS, which lessens errors in the OS loading process. UEFI also offers the opportunity to greatly expand processes that occur during the booting process before the OS loads.

Implement UEFI

Although it appeared as though UEFI was on a fast track to widespread implementation in the PC market, Microsoft announced in March that it wouldn't offer support for UEFI in its first version of Windows Vista. (Microsoft originally had planned to include UEFI support in all versions of Vista.) Microsoft, however, will include UEFI support in its Longhorn server when it appears in 2007.

Apple, meanwhile, is including support for UEFI in its new Mac computers that include Intel processors. Apple says the use of UEFI is one of the reasons its new Macs boot extremely quickly. UEFI also is helping Mac users run Windows in addition to their Mac OS by using Apple's Boot Camp software (which was in public beta testing at the time of this writing). ▲

by Kyle Schurman

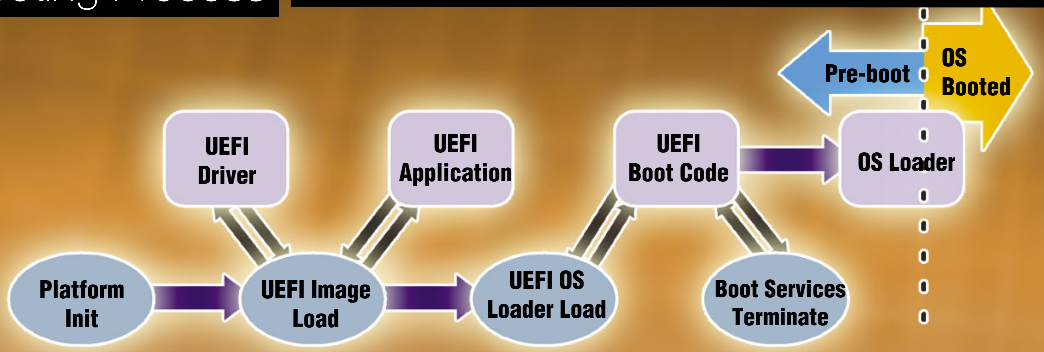
Working Under Legacy

As you can see from this chart, every key component of the computing environment has undergone a major revision—and often more than one—since the days when the BIOS first appeared. Other components have left legacy technologies behind. Changes to the BIOS have involved only additions to the basic legacy architecture. The BIOS hasn't undergone a major revision prior to UEFI. ▲

Component	Then	Now
CPU	16-bit internal and 8-bit external	64-bit extensions
Bus	8-bit ISA	PCI Express
Video	Text	SXVGA
Audio	Built-in PC speaker	High-def audio
OS	DOS	Protected-mode OSes

Source: Intel

UEFI Booting Process



UEFI provides a smooth interface between the BIOS and the operating system. The BIOS continues to handle the power up and POST phases of the platform initialization process (far left). UEFI operates on top of the BIOS during the booting process until handing over control to the OS.

UEFI Applications and Drivers. Either the Boot Manager or other UEFI applications loads these files. UEFI Image then uses these files to run.

UEFI Image. UEFI Image is a class of files that contain executable code and run under UEFI, making use of UEFI Drivers and Applications.

UEFI OS Loader. This UEFI application takes control of the system from the firmware and is in charge of loading the OS.

UEFI Boot Code. The Boot Code initializes the hardware from power up and eventually transfers control of the hardware to the OS. It also reads the flash memory, lets the BIOS perform the POST, and initializes the interface controllers and RAM.

Boot Services terminate. When the OS Loader properly loads the OS, it terminates the Boot Services and takes control of the system.

Once the OS loads properly and boots, it takes total control of the system from the UEFI interface and the BIOS. ▲

Sources: Intel, UEFI Forum

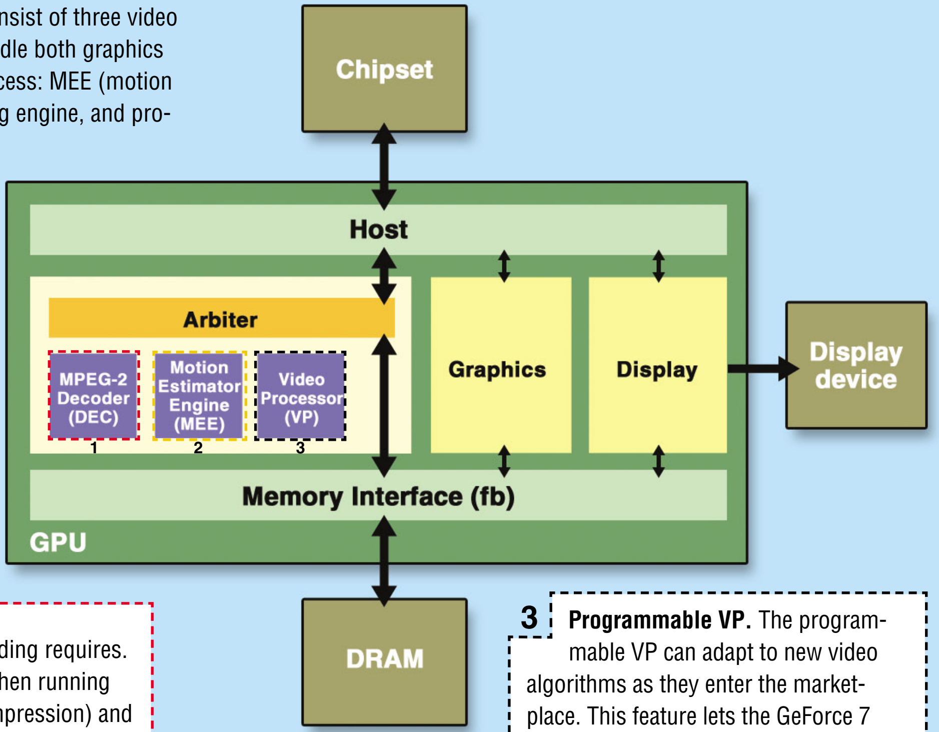
GeForce 7900

Greater Efficiency, More Power

Slight changes in Nvidia's GeForce 7900-series boards G71 GPU architectural design has helped to improve efficiency compared to previous GeForce boards. The newest Nvidia chips contain fewer transistors and feature smaller die sizes than previous GeForce chips (and competing chips), but they still deliver more processing power.

GeForce 7900 Processing Engines

The GPUs in the GeForce 7 family consist of three video processing engines that let them handle both graphics and video processing with equal success: MEE (motion estimation engine), MPEG-2 decoding engine, and programmable VP (video processor).



1 **MPEG-2 decoding engine.** GeForce 7-series GPUs can play back MPEG-2 video smoothly while taxing the CPU as little as possible thanks to the decoding engine.

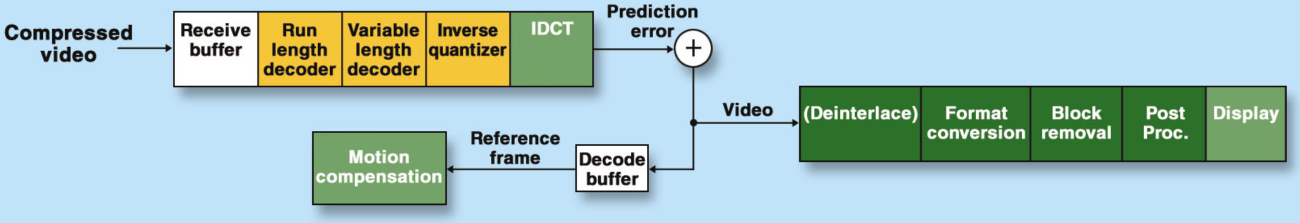
The diagram below shows the GPU's decoding engine at work. The green blocks represent a processing task that the GeForce 7-series GPU handles. Nvidia says the GeForce 7 handles more than 95% of the processing workload MPEG-2 decoding requires.

Two processor-intensive tasks when running MPEG-2 decoding, MC (motion compression) and IDCT (inverse discrete cosine transformation), are part of the GeForce 7's work. MC restores full frames from interframe, or temporal, differences, and IDCT converts data into spatial or pixel data.

The MPEG-2 decoding engine works well with DVD video, although you may not notice the differences. The engine works best with HD video, which results in smooth frame rates and almost no dropped frames.

3 **Programmable VP.** The programmable VP can adapt to new video algorithms as they enter the marketplace. This feature lets the GeForce 7 series support multiple standards. For example, the programmable VP can handle MPEG-4 as well as the H.264 format for HD video.

Nvidia designed the SIMD (Single Instruction, Multiple Data) vector processor that handles PureVideo technology specifically to handle video processing.



Source: Nvidia

GeForce Go 7900

Nvidia has released two boards for the notebook market in the GeForce 7900 family: the GeForce Go 7900 GTX and the GeForce Go 7900 GS.

The Go 7900 GTX is similar in features to the 7900 GTX designed for desktops. However, it has a slightly lower core clock speed and is designed to run at a lower temperature. ▲

Category	Go 7900 GTX	7900 GTX
Manufacturing process	0.09 micron	0.09 micron
Max core clock frequency	600MHz	650MHz
Graphics memory controller	256-bit GDDR3	256-bit GDDR3
Peak memory bandwidth	38.4GBps	51.2GBps
Interface	PCI-E x16	PCI-E x16
Multiple GPU support	Yes (SLI)	Yes (SLI)

Source: Nvidia

In March, Nvidia announced five releases under the GeForce 7 family: 7300 LE, 7600 GS, 7600 GT, 7900 GT, and 7900 GTX. For this White Paper we will focus on the two 7900 boards. In addition, Nvidia released a notebook version of the 7900 in April called the GeForce Go 7900; see the "GeForce Go 7900" chart for more information.

Efficient Design

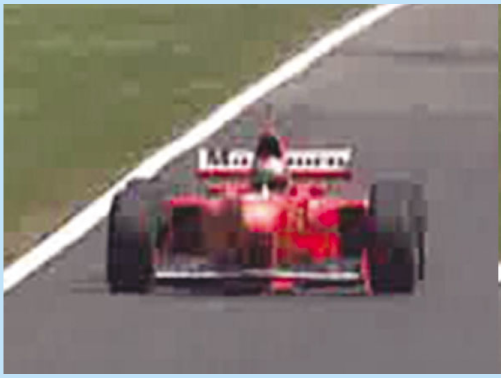
Nvidia's design and engineering gives the 7900 series a boost in its performance. Nvidia created the G71 GPUs for the 7900 series using a 0.09-micron manufacturing process. This manufacturing process has let Nvidia reduce the number of transistors by about 8% from chips in the 7800 series, but Nvidia didn't sacrifice any performance because the smaller transistors can run at an increased clock speed. Also, Nvidia says it has streamlined performance by improving the pipelines in the G71 chips, introduced more efficient FP (floating point) blending, and improved SuperAA performance.

Much of the rest of the architecture in the 7900 series is similar to the 7800 series. However, several media reports prior to the release of the 7900 boards indicated Nvidia would possibly double the number of pixel shaders in the G71 GPU. Ultimately, the 7900 series makes use of 24 pixel shaders and a maximum 24 pixels per clock cycle, which balances processing regardless of the type of load. Graphics boards that offer an imbalanced number of pixel shaders vs. pixels per clock cycle may suffer in certain situations. For example, a chip with a large ratio of pixel shaders to its maximum allowable pixels per clock cycle might perform well in many areas, but could struggle with games requiring a high textual load.

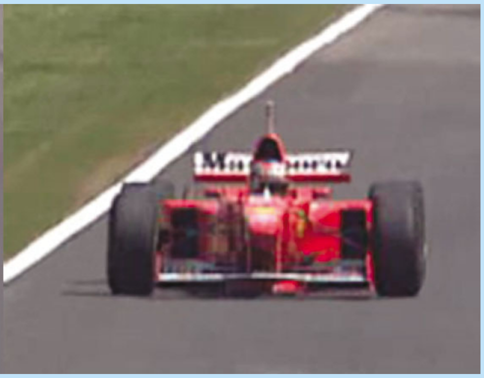
XHD Gaming & Quad SLI

The 7900 GTX and 7900 GT deliver enough graphics processing power to allow for XHD (Extreme High Definition) gaming. Nvidia says the 7900-series boards can deliver double the picture clarity found with a 1080p HD TV.

For the best results in XHD gaming, Nvidia recommends using the 7900 boards in a Quad



A video image without MEE; obviously blocky.



A video image using the MEE.

2

MEE. The MEE found in the GeForce 7 family greatly enhances the chips' ability to work with both video encoding and digital video recording. Video compression algorithms rely heavily on motion estimation to save data. (Motion estimation is the process of accurately estimating the movement of an object in a video stream from frame to frame without saving the specific data in the next frame. Instead, the video compression algorithm saves motion vectors, which let the GPU determine the movement of the object from frame to frame while requiring less data.)

In older systems the GPU might pass the processor-intensive task of motion estimation to the CPU. However, this was inefficient, and it usually was too much for the CPU to handle. But because of the MEE on the GeForce 7 family of chips, the GPUs can handle movement in video without relying on the CPU as much, resulting in better overall system performance.

The MEE also allows for recording and compressing of video data in real time, thanks to the use of motion vectors. Motion vectors help reuse data from frame to frame, improving overall recording quality and making greater video compression available. Greater video compression and better recording quality result in a smooth, accurate playback. The chips can't record and compress the data quickly enough without an MEE, which results in blocky video upon playback.

GeForce 7900 GTX vs. Radeon X1900 XTX

Nvidia's GeForce 7900 GTX and ATI's Radeon X1900 XTX have several similarities. For instance, both have identical core clock frequencies, and both chips make use of the 0.09-micron manufacturing process. But the GPUs behind these two competing boards have plenty of differences, with one of the most significant being their die sizes: The 7900 GTX has a 196mm² die size, compared to the approximate 352mm² die size of the X1900 XTX. By using a smaller die size, Nvidia can make more chips per wafer, which should lower prices for users. ▲

Category	**7900 GTX**	**X1900 XTX**
Manufacturing process	0.09 micron	0.09 micron
Number of transistors	278 million	384 million
Core clock frequency	650MHz	650MHz
Max graphics memory size	512MB	512MB
Graphics memory controller	256-bit GDDR3	256-bit GDDR3/4
Peak memory bandwidth	51.2GBps	49.6GBps
Interface	PCI-E x16	PCI-E x16
Number of pixel shaders	24	48
Number of vertex shaders	8	8
Number of texturing samples	16	16
Number of pixels per clock cycle	24	16
Multiple GPU support	Yes (SLI)	Yes (CrossFire)

Sources: Nvidia, ATI, X-bit Labs

SLI setup, where two graphics boards each containing two G71 GPUs operate as a team, allowing for the power of four GPUs in one system. (We discussed Quad SLI in detail on page 40 of the June *CPU*.)

Combining Quad SLI with G71 GPUs, gamers can use 30-inch XHD digital displays running at resolutions up to 2,560 x 1,600 dpi, even when running under high frame rates.

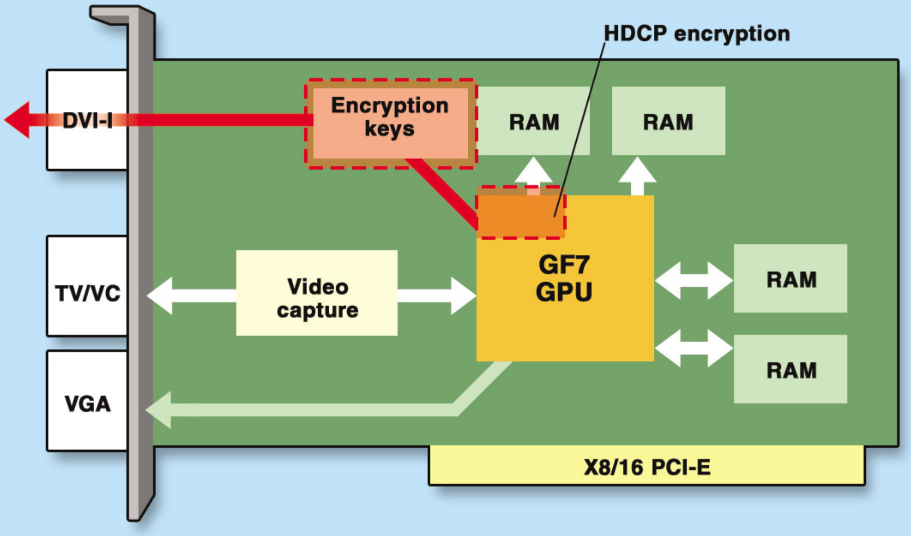
PureVideo

Using Nvidia's PureVideo technology, the GeForce 7900 boards can enhance HD video in a variety of formats, including H.264, VC-1, WMV, WMV-HD, MPEG-2 HD, and MPEG-2 SD. Furthermore, PureVideo works on all types of displays, and users can output the HD video at 720p, 1080i, and 1080p resolutions.

Nvidia's designers built PureVideo with the idea that the company could program it to encompass future video encoding formats, letting the technology remain relevant and up-to-date.

Supporting HDCP (Somewhat)

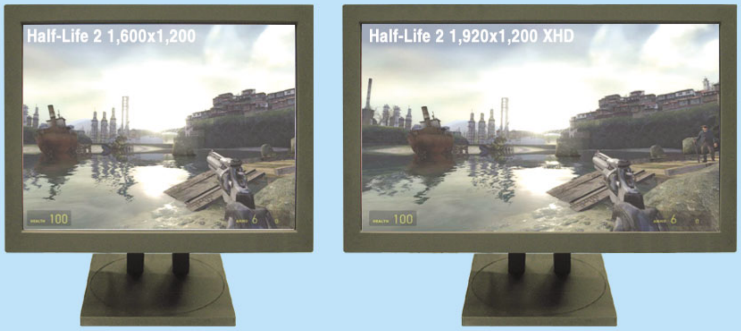
Nvidia created its G71 GPUs to support HDCP. (We discussed HDCP in the June *CPU* on page 42.) However, for HDCP to work properly, 7900-series board manufacturers also have to include HDCP support inside their boards and most of the early 7900 boards don't support HDCP.



When HDCP is used with a DVI connector, it protects the link for the HD video as it moves between the output device and the display device. (HDCP also works with an HDMI connector.) For HDCP certification hardware devices must contain encryption keys that are built into the hardware at the time of manufacturing, and, even though the 7900-series GPUs include HDCP support, not all 7900-series board makers are including that support.

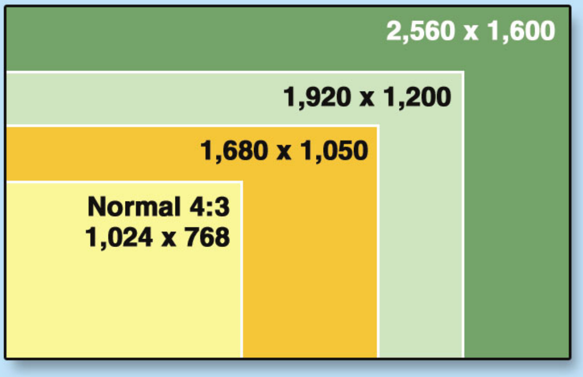
Source: Nvidia

Using XHD



Although gamers definitely appreciate the benefits of widescreens, nearly all desktop users will benefit from widescreens with XHD. XHD widescreen resolution is significantly higher than that of normal PC resolutions, allowing for more of the image to be visible, which is, as gamers know, a handy feature when playing a game.

XHD's widescreen capabilities are also useful for almost any user. With up to 20% more desktop space available for viewing compared to a normal monitor (4:3 ratio), users performing tasks ranging from video editing to multitasking will appreciate the widescreen view.



Source: Nvidia

Benchmarking

Benchmarking results from third-party sources, such as ExtremeTech, Neoseeker, and X-bit Labs, say the 7900 GTX is a strong offering and at least the equal or better in certain circumstances of ATI's Radeon X1900. For instance, in the May issue of *CPU* (page 16), boards featuring the GeForce 7900 GTX repeatedly received ratings of 4 or more CPUs out of 5.

For 7900-series users, determining which brand and model of board would work best in their situation will require a study of various benchmarks. Users will need to figure out which board works best with their favorite games and their system configuration.

The good news is it's difficult to go wrong with either Nvidia or ATI boards; both companies have some outstanding offerings available in the graphics board world. When calculating price vs. performance, the 7900 series may currently be the best bet of them all. ▲

by Kyle Schurman

GeForce 7900 GTX vs. GeForce 7800 GTX

When developing the GeForce 7900 GTX, Nvidia maintained much of the successful design of the GeForce 7800 GTX 512, modifying and streamlining some key features. For example, the 7900 uses 24 million fewer transistors than the 7800. By using fewer transistors, Nvidia has given the 7900 a smaller die area that generates less heat. In fact, the 7900 runs extremely quiet when compared to other newer graphics boards, and it makes use of the smallest heatsink and fan unit that Nvidia has used on a board in the past four years. Despite having fewer transistors, the 7900 series hasn't lost any processing power or capabilities compared to the 7800.

The 7900 GTX is the second high-end graphics processor for the desktop that runs at 650MHz, joining ATI's Radeon X1900 XTX. ▲

Category	7900 GTX	7800 GTX 512
Manufacturing process	0.09 micron	0.11 micron
Number of transistors	278 million	302 million
Core clock frequency	650MHz	550MHz
Max graphics memory size	512MB	512MB
Graphics memory controller	256-bit GDDR3	256-bit GDDR3
Peak memory bandwidth	51.2GBps	54.4GBps
Interface	PCI-E x16	PCI-E x16
Number of pixel shaders	24	24
Number of vertex shaders	8	8
Number of texturing samples	16	16
Number of pixels per clock cycle	24	24
Multiple GPU support	Yes (SLI)	Yes (SLI)

Sources: Nvidia, X-bit Labs

The decision to RAID a desktop system isn't one to take lightly. Nor is it something to fear. RAID, in all its various forms, represents a storage alternative that can deliver very real advantages to a desktop system. Whether those advantages will benefit you specifically depends on a multitude of factors. The first step in determining whether to implement a RAID on a desktop PC involves identifying those factors and assessing their relevance to your particular situation.

In the following articles, we explore the types of users and situations for which configuring a RAID makes sense. We've also compiled an article's worth of RAID projects for various scenarios and an article's worth of troubleshooting information for situations you're likely to encounter when setting up a RAID.

No. 1 Reason To RAID: Redundancy

As you probably know, the R in RAID stands for redundant, which refers to the simultaneous existence of identical content stored in two or more storage locations. Redundancy is arguably the most important benefit that RAID has to offer a desktop PC user, says Greg Schulz, founder and senior analyst of the Storage I/O Group (www.storageio.com), as well as the author of "Resilient Storage Networks."

"RAID lets you isolate and protect your computer against a disk drive failure. If you can't afford downtime, then RAID is in your future," says Schulz.

Redundancy occurs naturally with almost all types of RAID but is most pronounced and effective as part of the drive-mirroring process that RAID 1 supports. When a computer user implements a mirrored RAID array on a desktop PC, each of the drives in the array contains a complete set of files—including the operating system, program and data files, and anything else stored on the drive—that's needed to run the computer. Consequently, if one of the drives goes down unexpectedly, the other drive (or drives) continues to provide uninterrupted access to the system.

That's no small advantage. A casual user with a basic PC setup can get by without a computer for a day or so. A power user or small-business owner can't. The existence of a redundant drive makes it possible for such users to maintain around-the-clock access to their critical data sets. If one drive in the array should fail, the remaining drive (or drives) will keep the system up and running until the user restores the RAID to its full capacity. The mirrored desktop RAID configuration ensures that locally stored data is available whenever the computer is turned on.

58

RAID Workshop

Four Array Types Built To Order

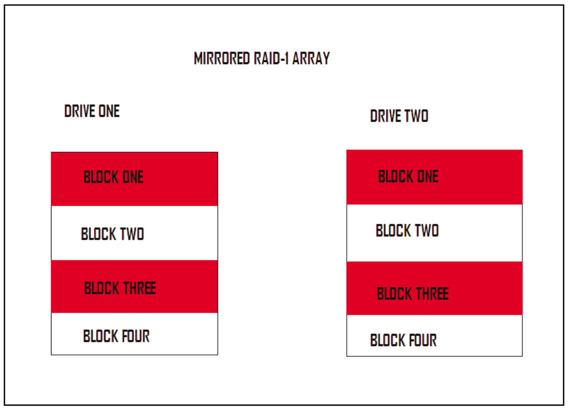
64

Before You RAID

Answers, Insights & Advice
For Common Pitfalls

TO RAID OR NOT TO RAID

Is The Payoff Worth The Effort On The Desktop?



The most stable RAID setup (and the one that makes sense for practically any user) is a mirrored RAID 1 array. "With a set of mirrored drives," says Rob Enderle, principal analyst at The Enderle Group, "you won't lose any data."

Such a discussion of redundancy begs one question: Is RAID a replacement for backup techniques? "Absolutely not," says Schulz. "RAID and backups are complementary. The backup is there so that if you delete a file, you can restore it and access it. RAID is there so that if a drive fails, you can keep working."

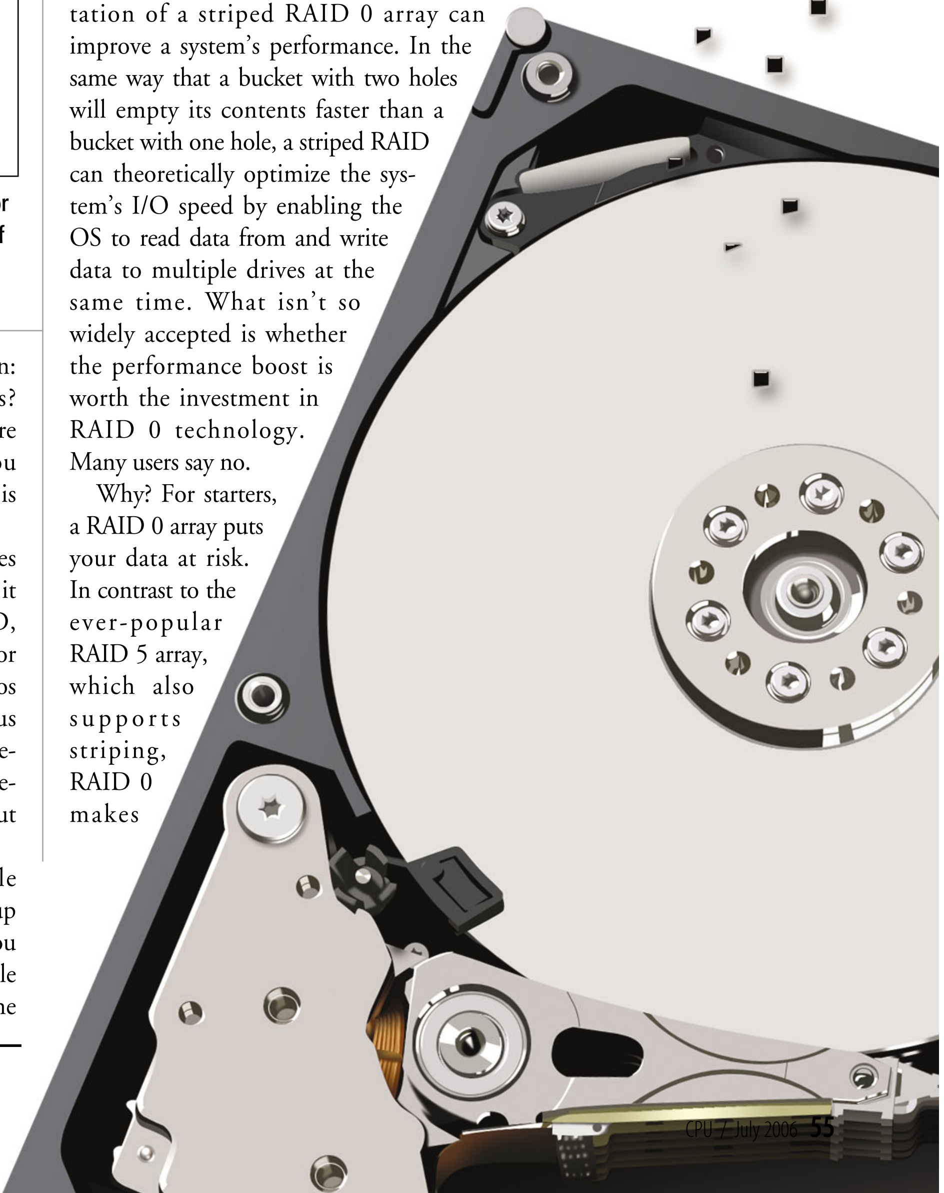
Of course, a mirrored RAID array certainly makes sense as part of a backup solution, too, in which case it offers the benefit of double-redundancy (the RAID, which contains redundant data, is itself redundant) for preserving irreplaceable files, including personal photos and videos, client lists, financial records, and various forms of digitized intellectual property. Users can implement a backup RAID within a desktop PC to complement a single boot drive or even a bootable RAID, but doing so consumes valuable space within the case.

Rob Enderle, principal analyst of The Enderle Group, says an alternative is to implement the backup RAID on a remote network server or NAS system. "You need to think about where you place a RAID," Enderle says. "It might be best to take it off premise. Because the RAID is remote from the PC, you can more effectively secure it from theft and disaster." A networked RAID can also function as a centralized storage server for all the devices in your home and office.

No. 2 Reason To RAID: Performance

It's a widely accepted notion that a desktop implementation of a striped RAID 0 array can improve a system's performance. In the same way that a bucket with two holes will empty its contents faster than a bucket with one hole, a striped RAID can theoretically optimize the system's I/O speed by enabling the OS to read data from and write data to multiple drives at the same time. What isn't so widely accepted is whether the performance boost is worth the investment in RAID 0 technology. Many users say no.

Why? For starters, a RAID 0 array puts your data at risk. In contrast to the ever-popular RAID 5 array, which also supports striping, RAID 0 makes



Adding a mirrored RAID to the desktop doesn't relieve you of backup responsibilities. One attractive option is a RAID-enabled NAS, such as the plug-and-play ReadyNAS NV (starting at $1,199 for 1TB; www.infrant.com).

no provisions for parity. As such it is the only configuration of RAID that isn't redundant. If one drive in the array goes down, the entire RAID goes down. Worse yet, the user will lose all the data contained on both drives. This process of striping data across multiple drives is like writing sentences across two sheets of paper. If one sheet of paper is lost or thrown away, the fragmented sentences and words printed on the remaining page make little if any sense. Likewise with a drive that contains only fragments of files. For anyone who values data, RAID 0 seems more like a threat to avoid than a technology to embrace.

Moreover, the actual performance boost that RAID 0 delivers often turns out to be considerably less impressive than expected, says Marty Czekalski, interface architecture initiatives manager at Maxtor and vice president of the SCSI Trade Association. "You will get a performance boost in RAID 0, but my own personal opinion is that the performance is not noticeable enough."

Those are fighting words to some RAID 0 devotees, who insist they've enjoyed faster system performance since implementing striped arrays. So who's right? Both probably. The key word in Czekalski's assessment is "noticeable." While most benchmarks show that a properly configured RAID 0 array will provide better performance than a single drive, the degree to which a RAID 0 array outperforms its competition varies widely, with typical performance gains measured in the relatively modest range of 3 to 20%. The benchmarks also indicate that RAID 0's performance benefits tend to be most pronounced in certain circumstances, most notably in large sequential data transfers, such as those involved in video- and audio-editing tasks.

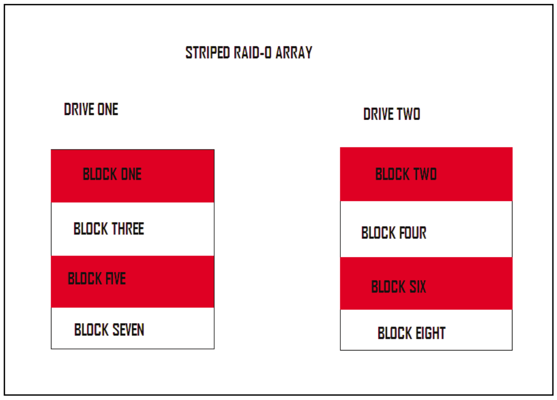
Desktop RAID 0 arrays have grabbed the attention of hard-core gamers looking for every advantage they can get. However, benchmark results seem to indicate that a striped array offers few if any advantages for most games, including first-person shooters. Games that involve large sequential data transfers, such as those based on the Infinity engine (Baldur's Gate, Planescape: Torment, etc.), will benefit most from RAID 0.

No. 3 Reason To RAID: Administrative Issues

Even if your RAID array delivers no benefits in terms of extra performance, it certainly has more to offer than mere data redundancy, notes Peter Radsliff, a senior director of category management in the branded solutions department at Seagate. Indeed, the technology has a certain administrative attraction for power users because a RAID requires scant attention once it's implemented. "We found that the people who appreciate it the most are the power users because they don't want to be system admins on the weekend." In other words, they don't want to deal with crashes.

And who can blame them. Crashes are nasty ordeals, but they prove particularly frustrating for businesses and power users. A casual user can recover from a drive crash in a couple of hours or as long as it takes to install a new drive, reinstall Windows, load a few home-productivity apps, and restore a backup. A power user, however, may spend days rebuilding a highly customized system from scratch. A RAID that involves mirroring lets power users eliminate the rebuilding process altogether. There's no downtime, no software installations, no tweaking of OS settings.

Moreover, a properly configured RAID can significantly decrease the odds that a catastrophic system crash would ever occur. Indeed, the redundant aspect of a mirrored array makes it an especially stable foundation on which to build a computer system. Consider the facts: Whereas a striped RAID 0 configuration effectively abbreviates the MTBF rate (if each drive in a striped two-drive array has a failure rate of 1:1,000, the odds of the RAID failing at any given time are 2:1,000 or 1:500 because a failure in either drive will crash the RAID), a mirrored RAID 1 configuration effectively prolongs it (if each drive in a mirrored two-drive array has a failure rate of 1:1,000, the odds of the RAID failing at any given time are 1:1,000,000 because it would take a simultaneous failure of both



A striped RAID 0 array brings the promise of better performance and 100% storage efficiency. That makes it a no-brainer, right? Wrong. "The problem," warns Hubbert Smith, director of enterprise marketing at Western Digital, "is that if either of those drives fails you lose all of the data on those drives." Carefully consider the value of your data before investing in a RAID 0 array.

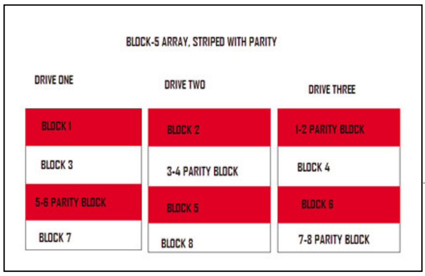
drives to crash the RAID). Adding a mirrored drive to a desktop PC is like wearing both a hat and sunscreen. If something happens to either one, you still won't get burned.

No. 4 Reason To RAID: Cost & Value

Ideally, cost shouldn't be the only consideration when deciding to implement a RAID array on a desktop PC. Whatever you might spend on a RAID 1 implementation will seem like a bargain the first time the mirrored array saves your PC from a catastrophic crash. The fact is, though, that a RAID upgrade comes at a price.

The primary expense associated with a RAID implementation is equipment. At the very least, a RAID 0 or RAID 1 array requires the presence of two drives; a RAID 5 array requires three or more. (Yes, we know it's possible to set up a RAID on a single drive, but we can't find a good reason why anyone would want to.) Users will get the best results by investing in drives with matching capacities—or, more specifically, equivalent LBA counts—rather than partnering an existing drive with whatever's on sale at Best Buy. A RAID adapter is also a necessary piece of equipment, although many motherboards sold these days have RAID functionality hardwired into them. Even so, you can count the actual out-of-pocket expense for setting up a RAID in multiple hundreds of dollars.

But that's the cost on paper. For most users the more important issue is value, and several things determine the value of a RAID. First, the RAID's storage-efficiency rate, which measures the amount of viable storage space as a percentage of total available storage space value, determines value. When it comes to storage, the most efficient RAID configuration is RAID 0, which has a theoretical efficiency rate of 100%. That means a pair of 100GB drives tied together in a striped RAID 0 configuration would have 200GB of available storage. The same drives together in a mirrored RAID 1 configuration, however, would have only 100GB of available storage space for an efficiency rate of 50%. RAID 5 has a variable storage-efficiency rate that the total number of drives in the array determines.



BLOCK-5 ARRAY, STRIPED WITH PARITY

DRIVE ONE	DRIVE TWO	DRIVE THREE
BLOCK 1	BLOCK 2	1-2 PARITY BLOCK
BLOCK 3	3-4 PARITY BLOCK	BLOCK 4
5-6 PARITY BLOCK	BLOCK 5	BLOCK 6
BLOCK 7	BLOCK 8	7-8 PARITY BLOCK

The roving parity block in a RAID 5 array lets this RAID configuration provide the protection of redundancy and relatively high storage efficiency. If one drive in a RAID-5 array crashes, you can use content from the other drives to rebuild it.

The value of the data also determines the value of a RAID system. Of course, that's a subjective determination, says Hubbert Smith, director of enterprise marketing at Western Digital, but for most users, the data will greatly outweigh the cost of an additional drive. "Mirroring is really simple, really cheap insurance for your family photos and MP3s," he says. "Look at it this way: If you're downloading files at $1 or $2 a song, it doesn't take too many to make a second drive worth it."

Finally, the value of your time in no small part determines a RAID's value. How much productivity is lost during a system crash? How many potential sales are lost? How valuable is your personal time? Businesses and power users often agree that the loss of mission-critical data for even a few hours will greatly exceed the price of a couple of high-quality hard drives.

Should You RAID?

So does a desktop RAID make sense for you? There's no right answer to the question, but many of you will benefit (if you already don't) from the technology, especially in the form of a mirrored RAID 1 array. The technology is slowly working its way into the mainstream and has become quite affordable. If you haven't already, this may be a good time to give it a try. ▲

by Jeff Dodd

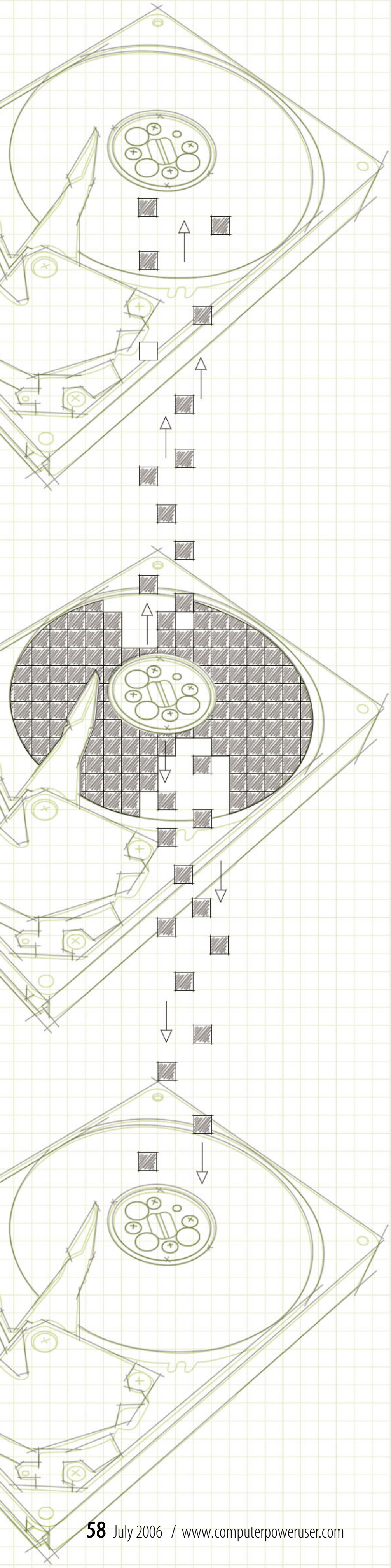
A Real-World RAID User

Name: Dan Payne
Hometown: Austin, Texas
Occupation: Freelance Web application developer
***CPU* Subscriber:** Since September 2005

When we asked Dan Payne, who works from home, why he RAIDed his desktop PC, he told us he needed real-time backups to protect his freshly authored code. Payne installed a backup software suite, but it proved a major drain on system resources. He then implemented a RAID. After a less-than-satisfactory experience with RAID 0+1, he set up a mirrored RAID 1 array. Payne says he's very happy with the results.

"I've gone through lots of hard drives over the last six years," Payne says, "and this is my first RAID setup. It beats any software backup solution out there." Payne notes that he continues to perform a nightly incremental backup to an offsite dedicated storage server to further protect his data.

Would Payne recommend RAID to others? "Absolutely," he says, noting that if his hard drive bites the dust, he won't experience any downtime. "I can keep right on working and just replace the dead drive when time permits." ▲



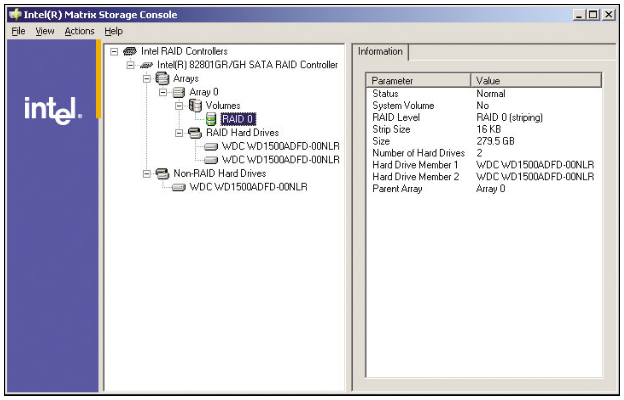
RAID WORKSHOP

Four Array Types Built To Order

The enthusiast community typically thinks of RAID 0 as an easy way to increase disk performance, but the native RAID controllers available today offer numerous other RAID modes that may be more beneficial, depending on your typical usage scenario. By now you know that you can use RAID 1 to mirror data on a pair of drives to keep your data safe in the event of a drive failure. RAID 5, 0+1, and 10 also offer varying levels of redundancy, capacity, and performance.

Western Digital's Raptor WD1500 is the highest-performing desktop SATA hard drive currently available. With support for NCQ and RAID-specific, time-limited error recovery, Raptor WD1500 drives are perfect candidates for use in a RAID array.

Armed with a handful of high-performance Western Digital Raptor WD1500 drives and an Asus motherboard with an Intel 975X Express chipset with an ICH7R I/O controller hub, we configured four of the most commonly supported RAID arrays. We will detail the installation processes and performance characteristics of each type on the pages ahead.



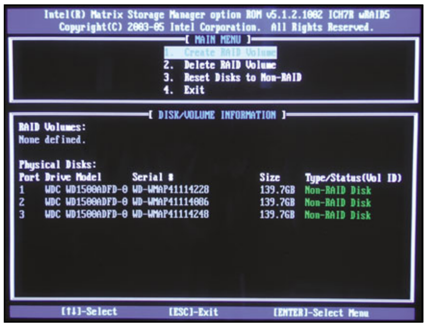
```
Intel RAID Controllers
  Intel(R) 82801GR/GH SATA RAID Controller
    Arrays
      Array 0
        Volumes
          RAID 0
        RAID Hard Drives
          WDC WD1500ADFD-00NLR
          WDC WD1500ADFD-00NLR
    Non-RAID Hard Drives
      WDC WD1500ADFD-00NLR
```

Parameter	Value
Status	Normal
System Volume	No
RAID Level	RAID 0 (striping)
Strip Size	16 KB
Size	279.5 GB
Number of Hard Drives	2
Hard Drive Member 1	WDC WD1500ADFD-00NLR
Hard Drive Member 2	WDC WD1500ADFD-00NLR
Parent Array	Array 0

You can use Intel's Matrix Storage Manager to configure and monitor any drive or RAID array connected to a compatible Intel-built I/O controller hub, such as the ICH7R.

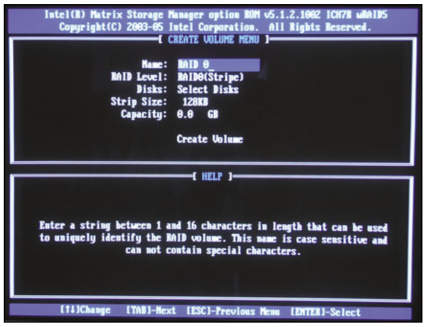
Each RAID mode the ICH7R supports (RAID 0, 1, 5, and 10) has its own distinct pros and cons. The configuration processes, however, are all very similar. You can configure RAID arrays via Windows using Intel's Matrix Storage Manager app or use the basic set of RAID BIOS options the system will typically make available at startup. Other RAID-capable chipsets function in a similar manner. Nvidia's nForce chipset family, for example, also has a Windows-based utility and RAID BIOS options. So, although the menus and screen shots on these pages aren't universal, they should be similar enough to help you configure RAID arrays on virtually any chipset. We'll detail the configuration process using the ICH7R's RAID BIOS options, as we know that not everyone is running a Windows OS.

RAID 0: Maximum Transfer Rates



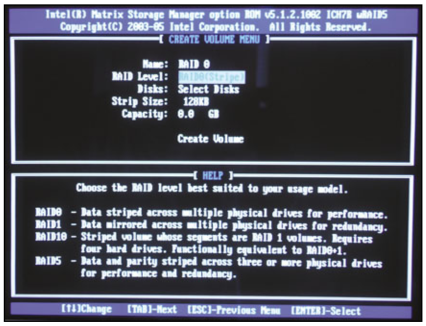
```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ MAIN MENU ]
1.  Create RAID Volume
2.  Delete RAID Volume
3.  Reset Disks to Non-RAID
4.  Exit

[ DISK/VOLUME INFORMATION ]
RAID Volumes:
None defined.

Physical Disks:
Port Drive Model      Serial #                Size     Type/Status(Vol ID)
1    WDC WD1500ADFD-0 WD-WMAP41114228         139.7GB  Non-RAID Disk
2    WDC WD1500ADFD-0 WD-WMAP41114086         139.7GB  Non-RAID Disk
3    WDC WD1500ADFD-0 WD-WMAP41114248         139.7GB  Non-RAID Disk

[↑↓]-Select          [ESC]-Exit          [ENTER]-Select Menu
```

Creating our RAID 0 array.



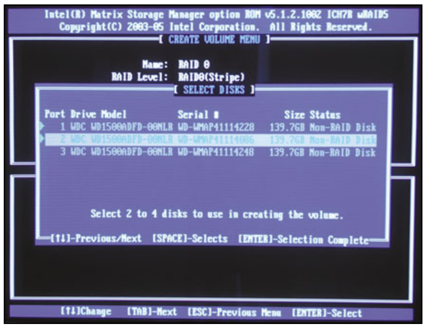
```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]
       Name:  RAID 0_
 RAID Level:  RAID0(Stripe)
      Disks:  Select Disks
 Strip Size:   128KB
   Capacity:  0.0   GB

              Create Volume

[ HELP ]
Enter a string between 1 and 16 characters in length that can be used
to uniquely identify the RAID volume. This name is case sensitive and
can not contain special characters.

[↑↓]Change   [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

Giving the RAID 0 array a name.



```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]
       Name:  RAID 0
 RAID Level:  RAID0(Stripe)
      Disks:  Select Disks
 Strip Size:   128KB
   Capacity:  0.0   GB

              Create Volume

[ HELP ]
Choose the RAID level best suited to your usage model.

RAID0  - Data striped across multiple physical drives for performance.
RAID1  - Data mirrored across multiple physical drives for redundancy.
RAID10 - Striped volume whose segments are RAID 1 volumes. Requires
         four hard drives. Functionally equivalent to RAID0+1.
RAID5  - Data and parity striped across three or more physical drives
         for performance and redundancy.

[↑↓]Change   [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

Setting the RAID 0 array's level.



```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]
       Name:  RAID 0
 RAID Level:  RAID0(Stripe)
[ SELECT DISKS ]
Port Drive Model            Serial #            Size Status
   1 WDC WD1500ADFD-00NLR WD-WMAP41114228   139.7GB Non-RAID Disk
   2 WDC WD1500ADFD-00NLR WD-WMAP41114086   139.7GB Non-RAID Disk
   3 WDC WD1500ADFD-00NLR WD-WMAP41114248   139.7GB Non-RAID Disk

        Select 2 to 4 disks to use in creating the volume.

[↑↓]-Previous/Next  [SPACE]-Selects  [ENTER]-Selection Complete

[↑↓]Change   [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

Selecting the drives for the RAID 0 array.

RAID Performance Battle Royal

To assess the performance of each RAID array we configured for this article, we used a handful of benchmarks available online (should you want to compare your results to ours). To isolate the performance of the RAID arrays, the OS partition resided on a separate drive connected to a Marvell SATA controller incorporated onto the Asus motherboard we used in our test system. We created all the RAID arrays on an Intel ICH7R I/O controller hub using numerous Western Digital Raptor WD1500 hard drives. We ran all the tests on an individual array after a fresh format to achieve maximum repeatable performance data.

Our test system included an Intel Pentium Extreme Edition 965 (3.73GHz), Asus P5WDG2-WS motherboard (975X Express), 1GB of Corsair TWIN2X1024-8500 (512MB x 2), an Nvidia GeForce 7900 GTX, and Western Digital Raptor 36GB (the OS drive) and various Western Digital Raptor 150GB drives (the RAID drives).

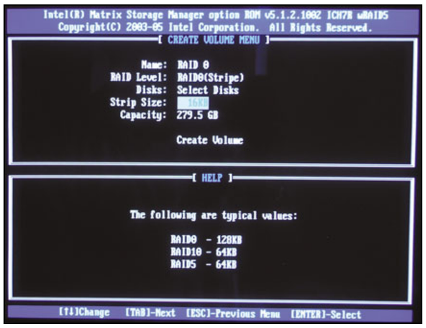
Our performance data reveals each RAID array's respective strengths and weaknesses (best scores are reported in bold italics). Compared to the baseline single-drive scores, the RAID 0 array offered nearly double the performance in Sandra's drive index and HD Tach's burst-speed tests. The RAID 1 array offered the best application loading and general usage performance, according to PCMark05, and the RAID 1's random access scores were also at the top of the charts.

The RAID 5 array, designed for performance and fault tolerance, seemed to falter, though; its average read and burst performance was better than the single-drive baseline, but it was outperformed in every other test. The RAID 5 array also had relatively high CPU utilization. The ICH7R's drivers likely held our RAID 5 array's performance back, as true hardware RAID controllers typically exhibit better RAID 5 performance.

The RAID 10 array seemed to offer a good balance of performance and redundancy, as it put up the best average read speed of the bunch, but remember that RAID 10 requires a minimum of four hard drives and a potent PSU. ▲

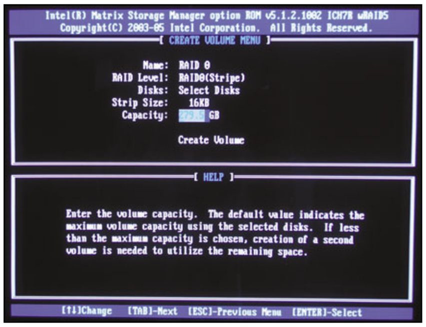
	Single Drive	**RAID 0**	**RAID 1**	**RAID 5**	**RAID 10**
Drives In Array	1	2	2	3	4
SiSoftware Sandra 2007 Pro File System Benchmark					
Drive Index	69MBps	***121MBps***	60MBps	44MBps	88MBps
Random Access	11ms	11ms	***1ms****	12ms	7ms
Futuremark PCMark05 HDD Test Suite					
Overall Score	7028	**9728**	8030	3372	9064
WinXP Startup	11.43MBps	14.30MBps	15.55MBps	6.03MBps	***16.69MBps***
Application Loading	9.67MBps	10.44MBps	***11.28MBps***	5.89MBps	9.65MBps
General Usage	8.48MBps	10.76MBps	***11.28MBps***	5.51MBps	10.06MBps
Virus Scan	88.65MBps	***124.23MBps***	80.97MBps	59.57MBps	113.98MBps
File Write	84.87MBps	***179.51MBps***	85.64MBps	15.35MBps	136.11MBps
HD Tach v3.0.1.0 Long Benchmark (32MB Zones)					
Burst Speed	134.3MBps	***244.1MBps***	99.3MBps	158.6MBps	243MBps
Average Read	78MBps	150.9MBps	77.2MBps	115.2MBps	***156.3MBps***
Random Access	8ms	8.5ms	***7.4ms***	8.5ms	8ms
CPU Utilization (± 2%)	**2%**	5%	**2%**	8%	6%

** Although the random access benchmark in Sandra 2007 repeatedly reported 1ms on the RAID 1 array, this score may not be accurate.*



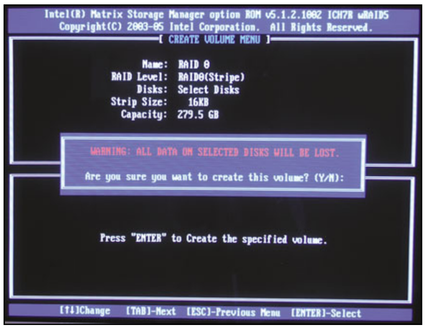
```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]

      Name:  RAID 0
RAID Level:  RAID0(Stripe)
     Disks:  Select Disks
 Strip Size:   16KB
  Capacity:  279.5 GB

             Create Volume

[ HELP ]

The following are typical values:

   RAID0  - 128KB
   RAID10 - 64KB
   RAID5  - 64KB

[↑↓]Change   [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

Designating the stripe size of our RAID 0 array.



```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]

      Name:  RAID 0
RAID Level:  RAID0(Stripe)
     Disks:  Select Disks
 Strip Size:   16KB
  Capacity:  279.5 GB

             Create Volume

[ HELP ]

Enter the volume capacity.  The default value indicates the
maximum volume capacity using the selected disks.  If less
than the maximum capacity is chosen, creation of a second
volume is needed to utilize the remaining space.

[↑↓]Change   [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

Setting the RAID 0 array's volume size.



```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]

      Name:  RAID 0
RAID Level:  RAID0(Stripe)
     Disks:  Select Disks
 Strip Size:   16KB
  Capacity:  279.5 GB

   WARNING: ALL DATA ON SELECTED DISKS WILL BE LOST.

  Are you sure you want to create this volume? (Y/N):

    Press "ENTER" to Create the specified volume.

[↑↓]Change   [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

Finalizing our RAID 0 configuration.

RAID 0 is probably the most common RAID mode among enthusiasts because it offers high-data transfer rates. Striped RAID 0 arrays achieve such rates because they can read/write data from more than one drive at any time. You'll rarely find this array used in enterprise settings, though, as RAID 0 offers no data mirroring or redundancy. RAID 0 requires two or more drives, but if any drive in the array fails, the data on the entire array is lost. That's why it's important to have a backup strategy in place with RAID 0.

Setting up a RAID 0 array is relatively simple. Before you begin, you'll need to enter the system BIOS and enable RAID mode for the SATA ports available on your motherboard. Most chipsets let you configure the SATA ports as standard drive controllers or for RAID. When you're certain that RAID support is enabled, connect the hard drives to the appropriate ports and power the system up. After the system completes its POST, you should see a prompt that says something such as Press CTRL-I To Enter RAID Setup (the prompt and key combination will vary among controllers).

Once you're in the RAID BIOS, you need to begin the initial creation process of the array, sometimes referred to as a RAID volume. Select the option to create an array and you should be prompted to name the volume or give it a numerical designation. Most controllers support more than one array at a time, so you have to give each one a unique label. We named our RAID 0 array "RAID 0" (creative, huh?) and moved to the next step, which was choosing the actual RAID level. We wanted to set up a striped array for performance benefits, so we chose RAID 0 from the list of options. All the RAID modes that your controller supports should be listed here.

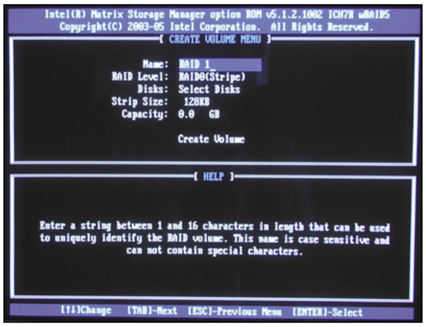
Next, we chose the drives we wanted to use in the array. As mentioned, RAID 0 requires two or more drives, but because we had more than two drives connected to the controller, we were prompted to choose the specific drives to use. We then had to set the stripe size (referred to as "strip" in Intel's RAID BIOS) for the array. You only need to configure stripe sizes on arrays that use a striping algorithm (0, 5, 10, etc). Smaller stripe sizes conserve drive space and perform best when working with smaller files, while larger stripe sizes perform best with larger files.

After choosing the RAID level and drives and configuring the parameters of the array, some RAID controllers will prompt you to set the size of the RAID volume. With RAID 0, the array's maximum size is the combined capacity of all of the drives in the array. In our case, two WD1500s linked to form a 280GB volume. Note that it's always best to use matched drives in a RAID 0 array when possible to prevent wasted space and to maximize performance.

With the configuration process completed, we finalized the creation of the new array. Note that once the volume is created, you will lose any data that was on the drives prior to connecting them to the RAID controller. All that was left to do at this point was boot the system and partition and format the array. Should you want to install an operating system on the newly created RAID volume, you will need to meet the requirements of your particular OS. In the case of Windows XP, you'll need your RAID drivers on a floppy diskette, and you'll have to press F6 during the initial stages of the Windows installation when prompted.

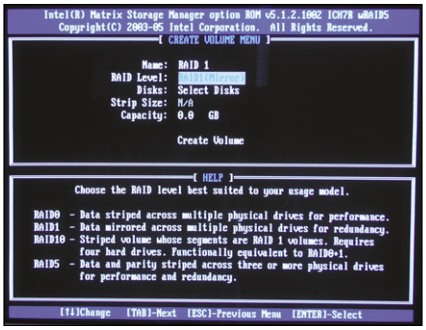
RAID 1: Look In The Mirror

RAID 1, also known as a mirrored array, requires installing pairs of drives for each RAID 1 volume in a system. Unlike RAID 0 which stripes data across multiple drives, RAID 1 duplicates the same data on a pair of drives. RAID 1 typically lowers the overall performance over a single drive due



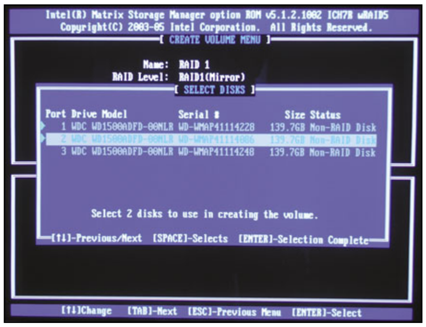
```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]

      Name:  RAID 1_
RAID Level:  RAID0(Stripe)
     Disks:  Select Disks
 Strip Size:  128KB
  Capacity:  0.0   GB

             Create Volume

[ HELP ]

Enter a string between 1 and 16 characters in length that can be used
to uniquely identify the RAID volume. This name is case sensitive and
can not contain special characters.

[↑↓]Change   [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

Our RAID 1 array now has a name.



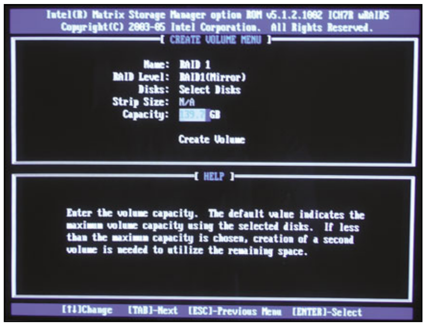
```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]

      Name:  RAID 1
RAID Level:  RAID1(Mirror)
     Disks:  Select Disks
 Strip Size:  N/A
  Capacity:  0.0   GB

             Create Volume

[ HELP ]
Choose the RAID level best suited to your usage model.

RAID0  - Data striped across multiple physical drives for performance.
RAID1  - Data mirrored across multiple physical drives for redundancy.
RAID10 - Striped volume whose segments are RAID 1 volumes. Requires
         four hard drives. Functionally equivalent to RAID0+1.
RAID5  - Data and parity striped across three or more physical drives
         for performance and redundancy.

[↑↓]Change   [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

Setting our RAID array to level 1.



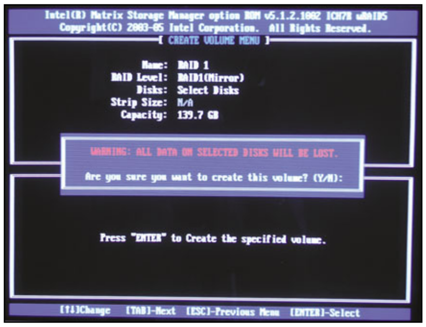
```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]

Name:  RAID 1
RAID Level:  RAID1(Mirror)
[ SELECT DISKS ]

Port Drive Model          Serial #          Size Status
   1 WDC WD1500ADFD-00NLR WD-WMAP41114228   139.7GB Non-RAID Disk
   2 WDC WD1500ADFD-00NLR WD-WMAP41114006   139.7GB Non-RAID Disk
   3 WDC WD1500ADFD-00NLR WD-WMAP41114248   139.7GB Non-RAID Disk

Select 2 disks to use in creating the volume.

[↑↓]-Previous/Next  [SPACE]-Selects  [ENTER]-Selection Complete

[↑↓]Change  [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

Selecting the drives that will make up our RAID 1 array.



```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]

      Name:  RAID 1
RAID Level:  RAID1(Mirror)
     Disks:  Select Disks
Strip Size:  N/A
  Capacity:  139.7 GB

             Create Volume

[ HELP ]

Enter the volume capacity.  The default value indicates the
maximum volume capacity using the selected disks.  If less
than the maximum capacity is chosen, creation of a second
volume is needed to utilize the remaining space.

[↑↓]Change  [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

By default the capacity of our RAID 1 was set to 139GB.



```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]

      Name:  RAID 1
RAID Level:  RAID1(Mirror)
     Disks:  Select Disks
Strip Size:  N/A
  Capacity:  139.7 GB

WARNING: ALL DATA ON SELECTED DISKS WILL BE LOST.

Are you sure you want to create this volume? (Y/N):

Press "ENTER" to Create the specified volume.

[↑↓]Change  [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

The last step in configuring the RAID 1 array was finalizing the array in the BIOS settings.

to drive-synchronization issues and data duplication, but it offers a level of fault tolerance because if one drive fails, data is preserved on the mirrored drive in the array.

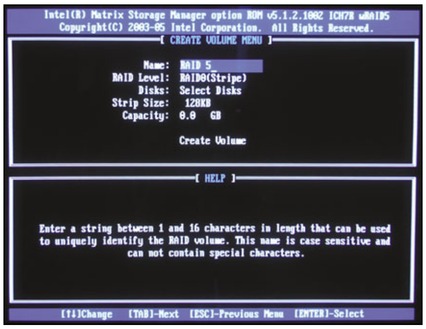
Setting up a RAID 1 array is very similar to configuring a RAID 0 array. With RAID support enabled in the system BIOS and the drives connected to the controller, we entered the RAID BIOS to begin the creation process and named the array "RAID 1." Because we were configuring a mirrored array for redundancy purposes, we chose RAID 1 in the next step of the configuration process from a list of supported RAID levels.

Next, we chose the drives that we wanted to use in the mirrored array. Remember that RAID 1 requires a pair of drives to work. Again, because we had more than two drives connected to the controller, we were prompted to choose the specific drives to use here. Prior to selecting the RAID level and the drives, we set the RAID volume size. With RAID 1 the array's maximum size is the capacity of the smallest drive in the mirrored pair. Because of this, we recommend using a matched pair of drives in RAID 1 arrays. In our setup we paired two WD1500 drives together to form a single, mirrored 139GB volume. After completing all the configuration steps, we finalized the creation of the RAID 1 array so we could partition and format it for use in the system.

RAID 5: Striping With Data Parity

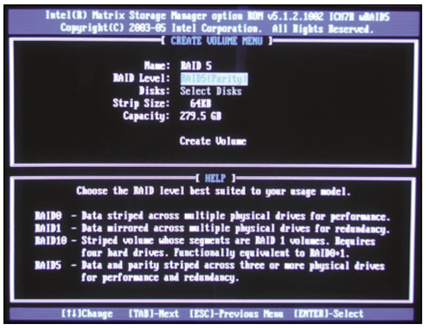
A RAID 5 array does striping with data parity and is relatively similar to a RAID 0 array. However, with RAID 5 each chunk of data that's written to a drive has an additional piece of parity data written to another drive to provide some level of fault tolerance. In this configuration losing a single drive won't bring down the entire array. Additionally, transfer rates are typically much higher than in a RAID 1 setup. The overhead that's required to calculate the parity data can have a significant impact on write performance, though, so transfer rates usually won't match those of a similarly configured RAID 0 array.

As with the other RAID types, we began our RAID 5 array configuration by



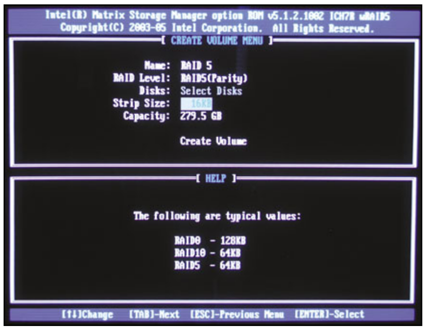
```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]

      Name:  RAID 5_
RAID Level:  RAID0(Stripe)
     Disks:  Select Disks
Strip Size:   128KB
  Capacity:  0.0   GB

             Create Volume

[ HELP ]

Enter a string between 1 and 16 characters in length that can be used
to uniquely identify the RAID volume. This name is case sensitive and
can not contain special characters.

[↑↓]Change  [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

Our RAID 5 array shall forever be now known as, er, "RAID 5."



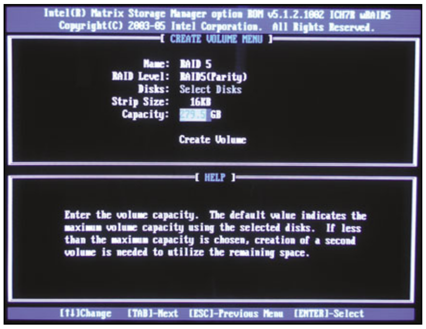
```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]

      Name:  RAID 5
RAID Level:  RAID5(Parity)
     Disks:  Select Disks
Strip Size:    64KB
  Capacity:  279.5 GB

             Create Volume

[ HELP ]
Choose the RAID level best suited to your usage model.

RAID0  - Data striped across multiple physical drives for performance.
RAID1  - Data mirrored across multiple physical drives for redundancy.
RAID10 - Striped volume whose segments are RAID 1 volumes. Requires
         four hard drives. Functionally equivalent to RAID0+1.
RAID5  - Data and parity striped across three or more physical drives
         for performance and redundancy.

[↑↓]Change  [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

To set the level for our RAID 5 array, we selected RAID5 (Parity).



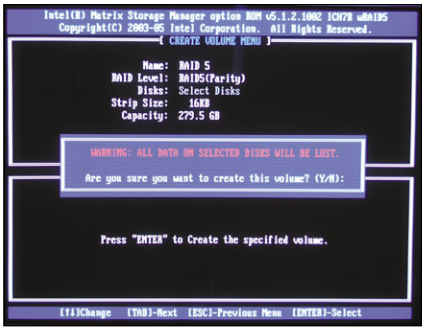
```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]

      Name:  RAID 5
RAID Level:  RAID5(Parity)
     Disks:  Select Disks
Strip Size:    16KB
  Capacity:  279.5 GB

             Create Volume

[ HELP ]

The following are typical values:

RAID0  - 128KB
RAID10 - 64KB
RAID5  - 64KB

[↑↓]Change  [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

When selecting the stripe size, note that a smaller stripe size conserves space, while a larger size helps with transferring large files.



```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]

      Name:  RAID 5
RAID Level:  RAID5(Parity)
     Disks:  Select Disks
Strip Size:    16KB
  Capacity:  279.5 GB

             Create Volume

[ HELP ]

Enter the volume capacity.  The default value indicates the
maximum volume capacity using the selected disks.  If less
than the maximum capacity is chosen, creation of a second
volume is needed to utilize the remaining space.

[↑↓]Change  [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

Setting the volume capacity of our RAID 5 array in the RAID BIOS.

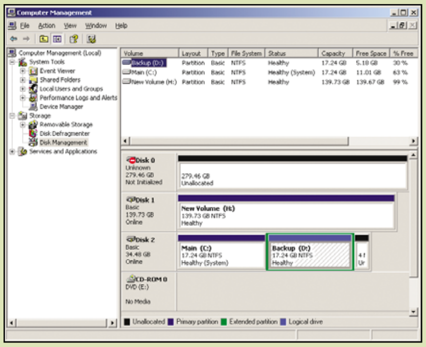


```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]

      Name:  RAID 5
RAID Level:  RAID5(Parity)
     Disks:  Select Disks
Strip Size:    16KB
  Capacity:  279.5 GB

WARNING: ALL DATA ON SELECTED DISKS WILL BE LOST.

Are you sure you want to create this volume? (Y/N):

Press "ENTER" to Create the specified volume.

[↑↓]Change  [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

Finishing the configuration of our RAID 5 array and its new 280GB volume.

Format The Array

When adding a new RAID array to an existing system with an OS installed, you need to partition and format the array before using it. Many third-party apps can do this, but WinXP's built-in Drive Management tools are probably the most used. A wizard will typically launch when Windows detects a new drive or array in a system. To manually partition and format a new array using WinXP's Drive Management, however, follow these simple steps:



Volume	Layout	Type	File System	Status	Capacity	Free Space	% Free
Backup (D:)	Partition	Basic	NTFS	Healthy	17.24 GB	5.18 GB	30 %
Main (C:)	Partition	Basic	NTFS	Healthy (System)	17.24 GB	11.01 GB	63 %
New Volume (H:)	Partition	Basic	NTFS	Healthy	139.73 GB	139.67 GB	99 %

Disk 0 Unknown 279.46 GB Not Initialized — 279.46 GB Unallocated

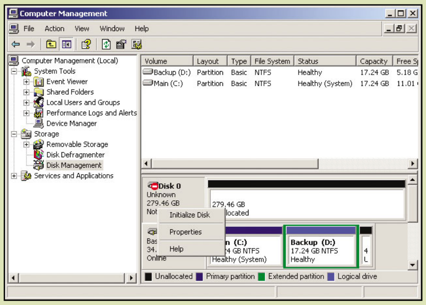
Disk 1 Basic 139.73 GB Online — New Volume (H:) 139.73 GB NTFS Healthy

Disk 2 Basic 34.48 GB Online — Main (C:) 17.24 GB NTFS Healthy (System) — Backup (D:) 17.24 GB NTFS Healthy

CD-ROM 0 DVD (E:) No Media

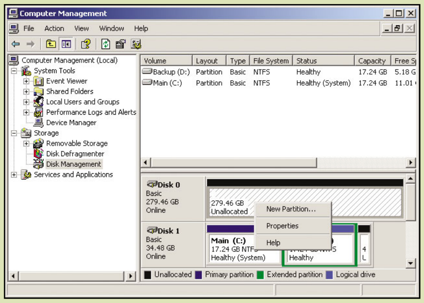
Step 1

Step 1. Open Control Panel, launch Administrative Tools, and double-click Computer Management. In the resulting window, click the Disk Management option in the left column. The Disk Management screen will appear at the window's right.



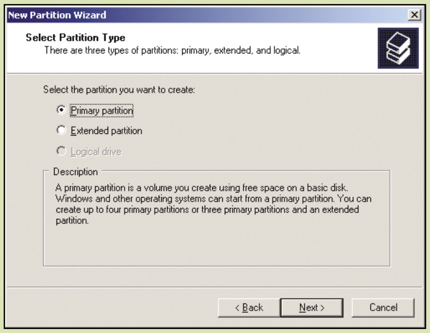
Step 2

Step 2. The new RAID array will appear in the Disk Management window as an uninitialized drive with 100% of its capacity designated as unallocated space. Right-click the disk label and choose Initialize Disk from the menu.



Step 3

Step 3. After initializing the array, you need to create a new partition. Right-click the capacity label and click New Partition in the menu.



Select Partition Type
There are three types of partitions: primary, extended, and logical.

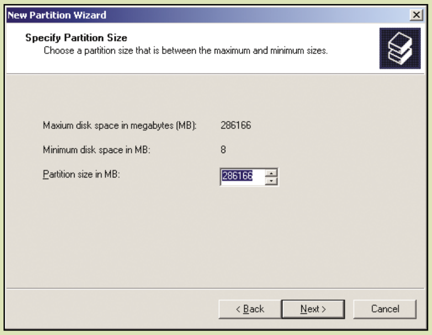
Select the partition you want to create:

● Primary partition
○ Extended partition
○ Logical drive

Description
A primary partition is a volume you create using free space on a basic disk. Windows and other operating systems can start from a primary partition. You can create up to four primary partitions or three primary partitions and an extended partition.

Step 4

Step 4. You'll now be asked to define the partition type: Primary Partition or Extended Partition. You can define up to four primary partitions or three primary partitions and one extended partition.

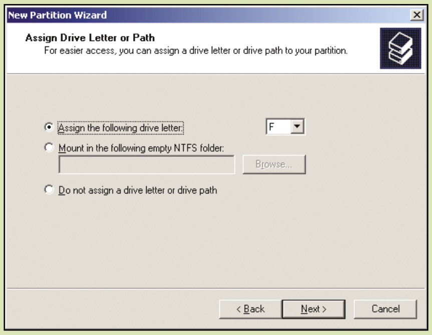


Specify Partition Size
Choose a partition size that is between the maximum and minimum sizes.

Maxium disk space in megabytes (MB): 286166
Minimum disk space in MB: 8
Partition size in MB: 286166

Step 5

Step 5. During the creation process, you'll set the partition size. Should the array's unallocated space be broken into multiple partitions, each one will appear as a separate drive to the OS.

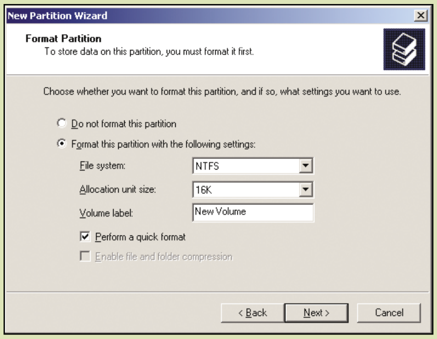


Assign Drive Letter or Path
For easier access, you can assign a drive letter or drive path to your partition.

● Assign the following drive letter: F
○ Mount in the following empty NTFS folder:
○ Do not assign a drive letter or drive path

Step 6

Step 6. Once the partition(s) is created, you'll assign an available drive letter or mount the volume in an empty NTFS folder.



Format Partition
To store data on this partition, you must format it first.

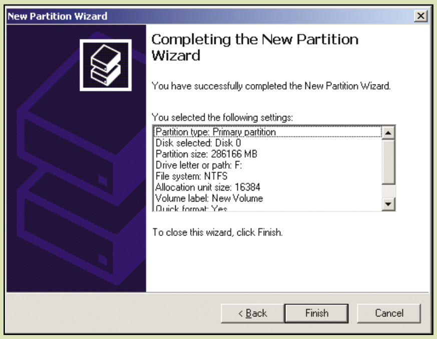
Choose whether you want to format this partition, and if so, what settings you want to use.

○ Do not format this partition
● Format this partition with the following settings:

File system: NTFS
Allocation unit size: 16K
Volume label: New Volume
☑ Perform a quick format
☐ Enable file and folder compression

Step 7

Step 7. You'll need to assign the file system type (NTFS or FAT), allocation unit size, and volume label to format the partition.



Completing the New Partition Wizard

You have successfully completed the New Partition Wizard.

You selected the following settings:
Partition type: Primary partition
Disk selected: Disk 0
Partition size: 286166 MB
Drive letter or path: F:
File system: NTFS
Allocation unit size: 16384
Volume label: New Volume
Quick format: Yes

To close this wizard, click Finish.

Step 8

Step 8. After verifying that all the settings are correct, click Finish to finalize the creation and formatting of the new partition.

properly setting up the system BIOS, connecting the drives to the proper SATA ports, and entering the RAID BIOS by pressing CTRL-I when prompted. We then chose the option to create a new RAID volume and named it "RAID 5."

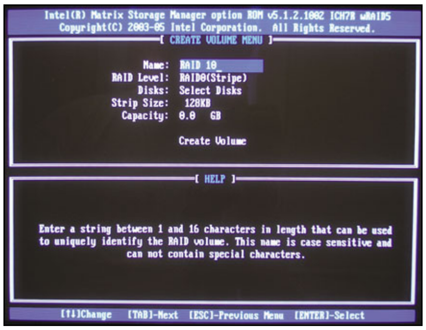
Next, we had to select the actual RAID level of the new volume. As you'd expect, we chose RAID 5 from the list of options. We should note, though, that because we had only three drives connected to the RAID controller, we weren't asked to select the drives to use in the array. RAID 5 needs a minimum of three drives to function, so all the drives connected were automatically selected. This may not be the case with every RAID controller, however.

At this point, we set the stripe size for the array. As mentioned, you only need to configure stripe sizes on arrays that use some type of striping algorithm (0, 5, 10, etc). Keep in mind that smaller stripe sizes conserve drive space and perform best when working with smaller files; larger stripe sizes consume more space but are preferable when transferring larger files.

After choosing the level and configuring the array parameters, we needed to set the RAID volume size. With RAID 5 the maximum size of the array is the size of the smallest drive times the total number of drives in the array minus one. In our setup we linked three WD1500 drives to form a 280GB volume. As is the case with most RAID arrays, it is best to use matched drives in a RAID 5 array to prevent wasted space and to maximize performance. With the configuration process complete, we finalized the creation of the array, saved the settings, and restarted the system. We were then able to partition and format the array.

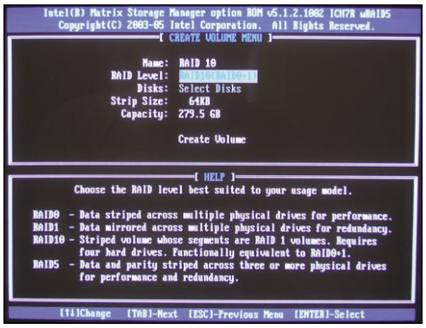
RAID 10: High Performance With Fault Tolerance

RAID 10 combines the best features of RAID 1 (mirroring) and RAID 0 (striping)—hence the "10"—to create large, high-performance arrays with superior fault tolerance. A RAID 10 array consists of a stripe across a number of mirrored drives. RAID 10 typically provides good overall performance by combining RAID 0's speed with RAID 1's redundancy without requiring parity calculations as in RAID 5.



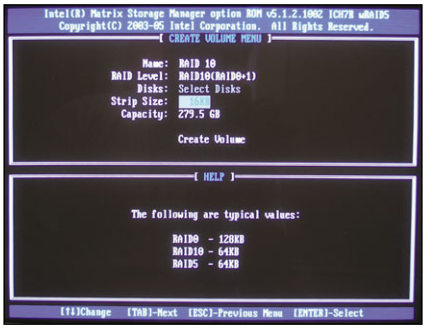
```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]
        Name:  RAID 10_
  RAID Level:  RAID0(Stripe)
       Disks:  Select Disks
  Strip Size:   128KB
    Capacity:  0.0   GB

               Create Volume

[ HELP ]
Enter a string between 1 and 16 characters in length that can be used
to uniquely identify the RAID volume. This name is case sensitive and
can not contain special characters.

[↑↓]Change   [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

Like our other RAID arrays, the first step with our RAID 10 array was playing the name game.



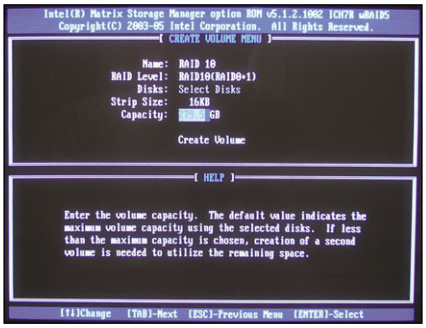
```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]
        Name:  RAID 10
  RAID Level:  RAID10(RAID0+1)
       Disks:  Select Disks
  Strip Size:    64KB
    Capacity:  279.5 GB

               Create Volume

[ HELP ]
Choose the RAID level best suited to your usage model.

RAID0  - Data striped across multiple physical drives for performance.
RAID1  - Data mirrored across multiple physical drives for redundancy.
RAID10 - Striped volume whose segments are RAID 1 volumes. Requires
         four hard drives. Functionally equivalent to RAID0+1.
RAID5  - Data and parity striped across three or more physical drives
         for performance and redundancy.

[↑↓]Change   [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

Setting up the RAID 10 array was similar to configuring our other arrays, including setting the RAID level.



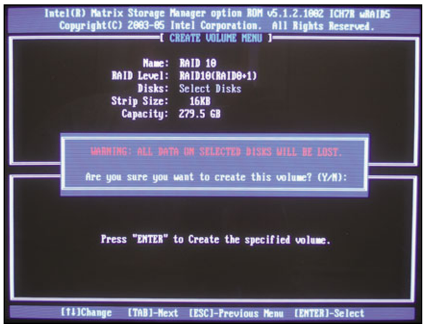
```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]
        Name:  RAID 10
  RAID Level:  RAID10(RAID0+1)
       Disks:  Select Disks
  Strip Size:    16KB
    Capacity:  279.5 GB

               Create Volume

[ HELP ]
The following are typical values:

RAID0  - 128KB
RAID10 - 64KB
RAID5  - 64KB

[↑↓]Change   [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

Even though RAID 10 mirrors data, you'll still need to set a stripe size for the array.



```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]
        Name:  RAID 10
  RAID Level:  RAID10(RAID0+1)
       Disks:  Select Disks
  Strip Size:    16KB
    Capacity:  279.5 GB

               Create Volume

[ HELP ]
Enter the volume capacity.  The default value indicates the
maximum volume capacity using the selected disks.  If less
than the maximum capacity is chosen, creation of a second
volume is needed to utilize the remaining space.

[↑↓]Change   [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

Spanning four drives, our RAID 10 array's capacity measured nearly 280GB.



```
Intel(R) Matrix Storage Manager option ROM v5.1.2.1002 ICH7R wRAID5
Copyright(C) 2003-05 Intel Corporation.  All Rights Reserved.
[ CREATE VOLUME MENU ]
        Name:  RAID 10
  RAID Level:  RAID10(RAID0+1)
       Disks:  Select Disks
  Strip Size:    16KB
    Capacity:  279.5 GB

WARNING: ALL DATA ON SELECTED DISKS WILL BE LOST.

Are you sure you want to create this volume? (Y/N):

Press "ENTER" to Create the specified volume.

[↑↓]Change   [TAB]-Next  [ESC]-Previous Menu  [ENTER]-Select
```

Finalizing our mirrored-and-striped RAID 10 array.

Aside from having to connect more drives to the system, setting up a RAID 10 array requires nothing more than the other array types we've covered. We ensured that the system BIOS was properly configured, connected the required number of drives, entered the RAID BIOS, and named the array. Next, we chose RAID 10 from the list of available array options. Again, we weren't asked to specify drives for the array because RAID 10 requires four drives minimum. We happened to have four drives connected to the controller, thus they were all automatically selected.

Although RAID 10 mirrors data across a pair of the drives, it's still necessary to choose a stripe size for the remaining striped portion of the array. We set the stripe size to a relatively small 16KB because we weren't planning to serve large files from the volume. Had we planned to work primarily with big files, we would have chosen a larger 64KB stripe size.

With RAID 10 the maximum size of the array is calculated by taking the smallest drive's size, multiplying it by the total number of drives in the array, and dividing by two. With four Western Digital Raptor WD1500 drives linked together in our system forming the RAID 10 volume, we had roughly 280GB available. After completing all the steps in the configuration process, we finalized the creation of the mirrored-and-striped RAID 10 array and were ready to partition and format it. ▲

(See our review of XFX's Revolution 3-Port RAID SATA Storage Pro card at www.cpumag.com/cpujul06/xfx.)

by Marco Chiappetta

BEFORE YOU RAID

Answers, Insights & Advice For Common Pitfalls

Preparing to migrate your data to a RAID-based storage solution in a desktop or SOHO system isn't something you should approach as casually, as say, a memory upgrade. You should weigh such considerations as fault tolerance, performance, redundancy requirements, and what you'll be using the system for. As the other articles in this section have addressed, such considerations will vary depending on the RAID setup you ultimately configure.

Before you configure a RAID, determine exactly what your RAID-storage requirements are. For example, will you use the RAID array as the primary volume that holds your OS installation? Are you interested in RAID primarily for its capacity-expanding, redundancy, or performance capabilities or all the above? The following are common questions and concerns many users with and without RAID experience have in respect to configuring, running, and troubleshooting a RAID array, along with some answers, insights, and advice.

Plan Your RAID

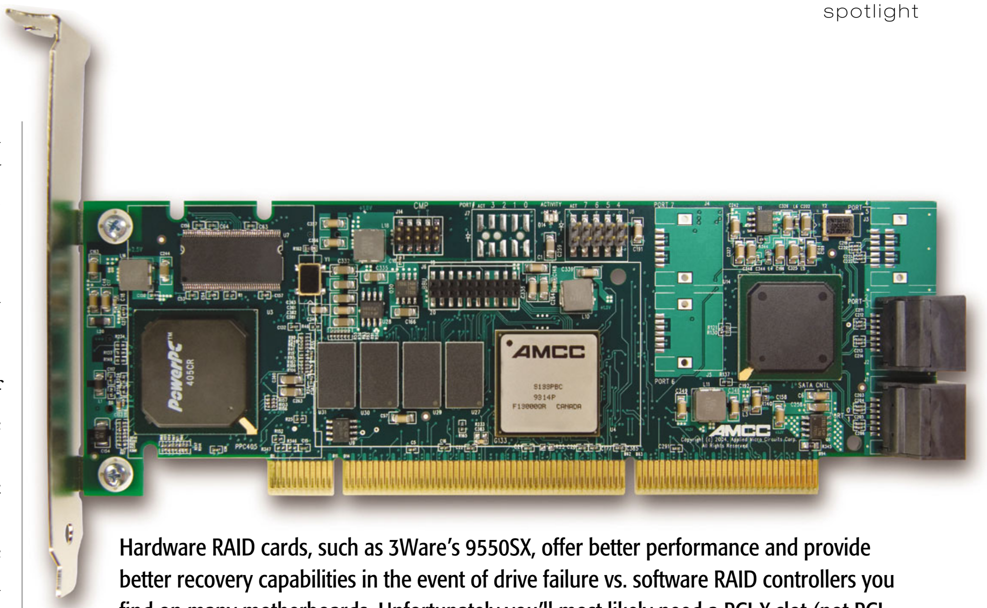
Like any computer project, take some time to consider what you want to accomplish with your RAID setup. This will help a great deal toward determining the type of RAID you'll use and what you'll need.

Q Which RAID level is best for me?

A This is probably the most commonly asked question among potential RAID users, but it's often the most complex question to answer, as the RAID type really depends on the user. If you're hell-bent on getting the best performance and highest capacity from your hard drives, RAID 0's striping characteristics are probably best. RAID 1's mirroring traits most likely aren't an option for performance-conscious users, as it's the slowest of the RAID configurations and is also the least efficient where it pertains to capacity and cost.

RAID 0 is generally recommended for most enthusiast desktop users, as they are looking for no compromises in performance or capacity. Be advised, though, that you should plan on backing up critical files and settings regularly. We have run RAID 0

Western Digital's WD1500 Raptor drives have special performance compensation technologies built in for drives used in vibration-prone RAID environments.



Hardware RAID cards, such as 3Ware's 9550SX, offer better performance and provide better recovery capabilities in the event of drive failure vs. software RAID controllers you find on many motherboards. Unfortunately you'll most likely need a PCI-X slot (not PCI Express) to accommodate one, at least until PCI-E variants emerge on the market. When PCI Express-based hardware RAID controllers come to market, we all may start finding a compelling use for those extra PCI-E slots on the latest motherboards.

configurations for years with few issues and virtually zero data loss, but we generally only use drives from major manufacturers in RAID 0 arrays. Such makers as Seagate, Western Digital, Hitachi, and others specify certain drives for RAID use and build drives with special data protection, resiliency, and performance features to accommodate the higher demands of RAID environments. Conversely, use RAID 1 for its redundancy characteristics, as it essentially provides a live, dynamic backup of your entire drive image.

The next most-viable option for average users is RAID 5, which provides a good compromise of read performance, capacity, cost per gigabyte, and fault tolerance. RAID 5 requires at least three drives, so the entry point cost-wise is higher than an array that requires only two drives in minimum configurations. RAID 5 has relatively poor write performance due to its parity-calculation requirements, so if you're a video-editing buff, for example, you're probably better off looking to other RAID options. Additionally, RAID 5 has higher CPU utilization, especially if you're considering a software-based RAID controller instead of a dedicated hardware controller. It's hard to beat RAID 5's efficient disk utilization, however, which is similar to RAID 0, or its ability to provide the capacity of more than one drive.

Q **What's the difference between a software-based RAID solution and a hardware-based one, and does it matter which one I use?**

A Most desktop motherboard RAID solutions are software-based. The RAID controllers—such as those you'll find with Intel's ICH7R southbridge; Nvidia's MCP in the nForce 4 chipset; and even discrete chips from Promise, Silicon Image, and Highpoint—are pretty much "dumb" controllers that push RAID-processing functions to the host CPU. In short, there's no offload of RAID-processing requirements, and if the host system and OS go down, there's greater potential for data loss. That doesn't mean these controllers aren't viable solutions. They're actually low-cost solutions for such a high-end function as RAID. The benefits of true hardware RAID cards, however, such as those from 3Ware, Adaptec, and LSI, are worth considering if it's in your budget.

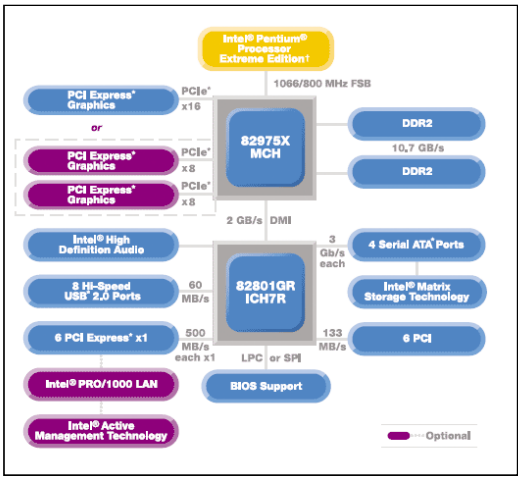
Hardware RAID cards have their own local RAID processor onboard, plus dedicated onboard cache for full hardware offloading of RAID-processing functions. This offers a level of redundancy in itself, as the controller operates in an asymmetrical parallel-processing function in conjunction with the host CPU. If the host CPU is unresponsive, the card's RAID processor and its cache can somewhat maintain data integrity on the controller card. Additionally, the ability of hardware RAID controllers to rebuild an array in the event of a drive failure is superior to what software RAID controllers offer.

Although the performance advantages of a dedicated hardware resource for RAID functionality are also obvious, a hardware-based RAID solution for many enthusiasts and average home users may be overkill. This is especially true considering the average hardware RAID controller lists for well over $200, and software RAID controllers are essentially freebies on most high-end motherboards. Additionally, most hardware RAID controllers on the market today are PCI-X cards (a 133/66MHz, 64-bit PCI slot, not to be confused with a PCI Express slot), a slot configuration that's probably more common on server motherboards than on most desktop boards.

Seagate's Barracuda 7200.10 drives at 750GB consume 13W of power during active operation. This might not seem like much on the surface, but RAID three of them together, and they may tax your system's power.

Q **What type of power should I budget for in a RAID drive system, and are there special power supply requirements I should know about for RAID?**

A You should absolutely take steps to make sure your PSU is up to the task of supporting multiple hard drives from a



The Intel ICH7R southbridge chip you will find coupled with existing Intel chipsets for desktop motherboards offers RAID 0, 1, 5, and 10 capabilities, but it uses software-based RAID. This is a more-than-capable solution for average users looking for basic RAID 0 or 1 features, but RAID 5 and 10 parity-processing requirements will be better served on a dedicated hardware RAID controller.

loading standpoint. Most hard drives require 12V (+/- about 10%) and 5V (+/- about 5%) power sources with an average draw of about 1W in sleep mode and up to 13W or so during active read/write operations. If you're upgrading a system from a single-drive configuration to a three-drive RAID 5 setup, for example, you could incur over a 20W increase in power demand across your 12V and 5V rails. Couple that with the heavy 12V load that dual PCI-E graphics cards can impose, and you might push your PSU past its peak limits. As a rule of thumb, we don't suggest using anything less than a 450W PSU these days. However, if you plan to run dual graphics cards and a RAID setup, we suggest a PSU with output power north of 500W with at least dual 12V rails.

When Things Go Wrong

You have your hardware strategy mapped out, the components are in hand, and it's time to put your RAID together. Hopefully, you won't run into any pitfalls, but there's always the possibility you will. We've navigated through many typical RAID problems over time; here are a few typical problems you might encounter, so you're not swimming in uncharted waters.

Q My RAID 0 array is configured in the RAID BIOS. Both drives are initializing at boot, but I can't get Windows XP to install on the drives, and I keep getting an error that no drives were found. Is the RAID controller defective?

A This is easily one of the most common questions we receive for *CPU*'s monthly "Advanced Q&A Corner" article. It's also one of the easiest questions to provide a solution for. What you're actually seeing is part of the WinXP installation process on a RAID array. The problem is symptomatic of WinXP not having the proper RAID controller drivers bundled with the OS for your particular motherboard or RAID card.

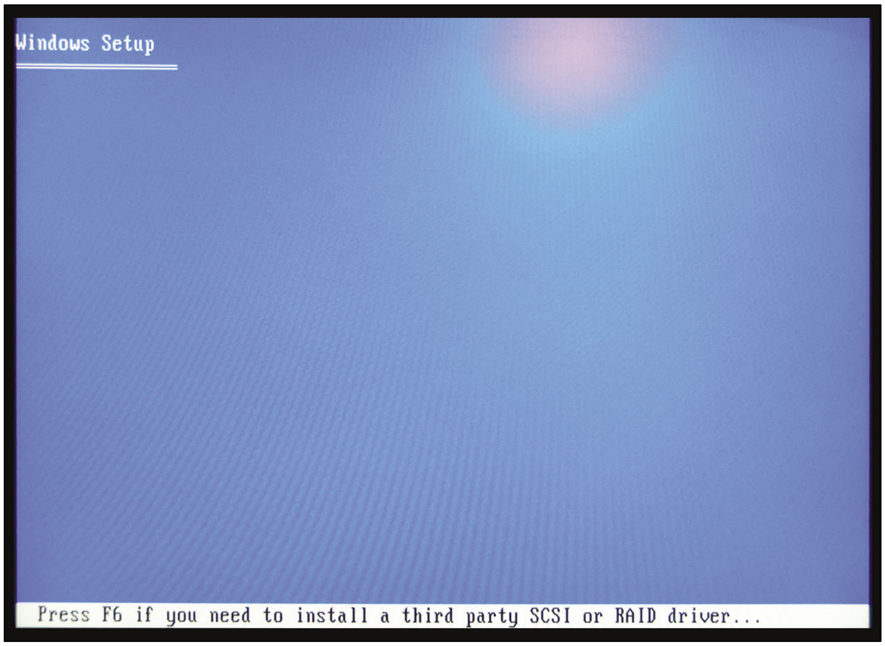
While WinXP is booting from the installation CD, you'll see a screen that reads Press F6 If You Need To Install A Third Party SCSI Or RAID Driver. Press F6 immediately. After Windows finishes loading the rest of its driver database, you will see a message indicating that Windows couldn't determine one or more mass storage devices installed in your system, thus prompting you to press S to specify additional devices. Press S and insert the RAID driver on floppy that came with your motherboard or RAID controller card. If you don't have a floppy, you'll need to create one using a utility on the drivers CD that came with your motherboard. Obviously, you'll need another system running to do this. Once you have loaded the RAID controller drivers, WinXP should see your newly created RAID array and let you partition and format drive space for the OS installation.

Q I've been running a RAID 0 array for months and recently performed a memory upgrade. Since then I can't get my RAID array to initialize and boot Windows. Is this indicative of a drive failure? Did the memory upgrade cause the problem? What can I do to get my array back?

A In a RAID 0 array there are typically two situations in which you will encounter boot problems. Most likely the problem is occurring because one of the two drives is faulty or somehow has lost communication to the controller. The main screen of your RAID BIOS utility should provide you the status of your RAID array and let you determine which drive(s) is at fault.

A healthy RAID 0 array will show you the configuration status as striped, along with the total array size, which should equal the capacity of both hard drives together. If one drive goes down, you'll only see one drive in the

The FSP Epsilon FX700-GLN line of 700W PSUs have quad 12V rails at 15 amps and a 5V source at 30 amps, which is the kind of power you will need to run a multidrive RAID array in conjunction with dual graphics cards in a high-end gaming system.



```
Windows Setup

 Press F6 if you need to install a third party SCSI or RAID driver...
```

During Windows XP's initial startup installation screens, you're prompted to press F6 to install third-party RAID drivers. If you miss this screen and don't install the necessary RAID controller drivers, WinXP may not recognize your RAID array and install the OS.

RAID BIOS with no array type listed, and the array's size will show only the one drive's capacity. More often than not, this error is the result of a faulty drive cable, especially when using SATA drives because SATA cables can dislodge from the motherboard relatively easily. You may have simply knocked a cable slightly loose at some point. Check that all the data and power cables are seated properly and then try rebooting.

If this doesn't help, you may have a bad hard drive, which unfortunately means your data and the RAID 0 array may be lost unless you spend serious money with a data-recovery service. That's why it is important to, at the least, do nightly backups if you have critical files and information on a RAID 0 installation. Otherwise, consider running your OS, games, and other noncritical applications on a RAID 0 array and store your valuable files on a RAID 1 array to take advantage of its redundancy and failsafe features.

Cover Your Assets: RAID 1 & Backups

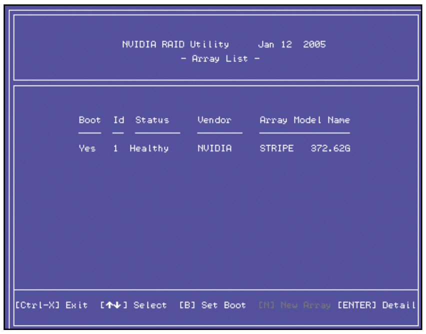
RAID 0 arrays have without question become wildly popular among performance- and gaming-minded desktop users. This is partly due to Intel, Nvidia, and other chipset makers engineering high levels of RAID integration into products that have proliferated in the mainstream. Software-based RAID is now commonplace in desktop rigs, and drive manufacturers have followed suit by releasing desktop drives with RAID-enhancing and supporting technologies that historically you used to only find in server- or enterprise-class products. (Why wouldn't drive manufacturers cater to potential RAID users when they can sell two or more hard drives at a time?)

Q What recovery procedure should I use if a drive failure breaks my RAID 1 mirror?

A For average desktop and SOHO users, RAID 0 and 1 are the most suitable solutions, with RAID 1's mirroring abilities being particularly enticing for those looking for a setup in which if one drive goes south, you simply replace it, and your data remains intact. The beauty of RAID 1 is that you can just power down the system, yank out and replace the bad drive, power back up, and rebuild the array with the new drive in the RAID BIOS where the reimaging and mirroring process is done automatically. Certain SATA controllers, such as those in Nvidia's MCP southbridge, actually support live hotswapping of drives. We're a bit squeamish of this feature, though, as it doesn't seem a natural act for a desktop machine. That said, we've seen it work successfully.

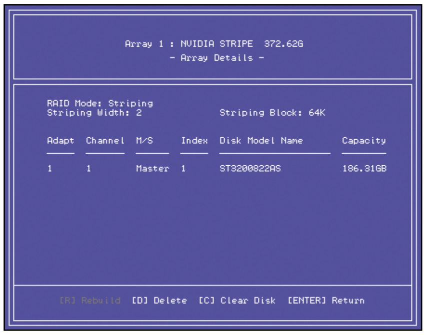
Regardless of how you protect your data—be it through redundant, fault-tolerant RAID configurations or external backups—the bottom line is to not leave yourself swinging in the breeze by using a RAID 0 array exclusively unless, of course, you can tolerate a total loss. The upside is that such a disaster might just be the excuse you need to justify the expense of making a costly RAID upgrade. ▲

by Dave Altavilla



```
NVIDIA RAID Utility     Jan 12  2005
        - Array List -

Boot  Id  Status     Vendor    Array Model Name

Yes   1  Healthy     NVIDIA    STRIPE   372.62G

[Ctrl-X] Exit  [↑↓] Select  [B] Set Boot  [N] New Array [ENTER] Detail
```

A healthy RAID 0 array shows its stripe configuration in the RAID BIOS, as well as the array's size, which should equal the capacity of both drives together.



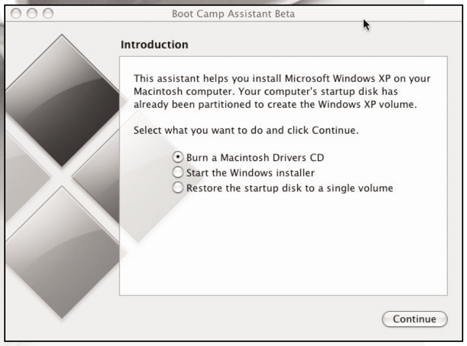
```
Array 1 : NVIDIA STRIPE  372.62G
      - Array Details -

RAID Mode: Striping
Striping Width: 2              Striping Block: 64K

Adapt  Channel  M/S     Index  Disk Model Name      Capacity

1      1        Master  1      ST3200822AS          186.31GB

[R] Rebuild  [D] Delete  [C] Clear Disk  [ENTER] Return
```

A RAID 0 array that loses communication with one of the drives due to drive failure or a cable-disconnect issue will show one drive and the channel it is on or no drives at all. If one drive is visible, you can determine which drive failed by checking the channel number the good drive is on.

by Warren Ernst

The Bleeding Edge Of Software

Inside The World Of Betas



This assistant helps you install Microsoft Windows XP on your Macintosh computer. Your computer's startup disk has already been partitioned to create the Windows XP volume.

Select what you want to do and click Continue.

● Burn a Macintosh Drivers CD
○ Start the Windows installer
○ Restore the startup disk to a single volume

Official product name: Boot Camp
Version # previewed: 1.0 Beta 1
Publisher: Apple Computer
Developer and URL: Apple Computer; www.apple.com
ETA: Q4 2006
Why you should care: Weren't you paying attention? Windows on a Mac!

Apple Boot Camp 1.0 Beta 1

Leave it to Apple to turn a significant event in personal computing into a straightforward, simple process, such as running Windows XP on an Intel-based Mac. The magic comes via Boot Camp, now in beta but which may be included in the next OS X version.

Boot Camp first checks your new Mac for the most recent firmware; it foists you to Apple's site to search for, download, and install the firmware if necessary. BC then creates a Windows driver disc for your Mac hardware; insert a blank CD and you get a driver setup disc you run after installing Windows. Third, BC nondestructively creates a blank Windows partition, shrinking your existing Mac partitions to make space. Finally, BC creates a boot loader and emulates a BIOS to let Windows start. Once you run BC and reboot, you install WinXP from an installation disc and then run the driver disc. The whole process takes about an hour.

Running Windows on a Mac seems like something out of "The Twilight Zone." What makes it weirder is there are almost no compromises. Windows seemed to run at full speed on my test rig (a fast Core Duo model), all Windows peripherals worked as if plugged into a Dell or whitebox PC, and I could switch between OSes by pressing the ALT key at boot. No surprises or hiccups.

There have been reports of corrupted OS X installations after running Boot Camp, but conventional wisdom is that those people installed Windows to the OS X partition, so be careful with that. Otherwise, the beta worked as most other final Apple products, which is to say, very well. Hath hell frozen over? You be the judge. ▲

Opera 9.00 Beta

Looking for a free, cross-platform Web browser with far more features than Internet Explorer but isn't vulnerable to IE's hacks? Sounds a lot like Firefox, but it actually applies equally to Opera. At one time, Opera was a commercial program with a paid version or free version with banner ads, but it has since gone free, meaning it costs nothing to check out what it offers—and what it offers is extensive.

Opera is obviously a fast browser, including many of the features available in Firefox through extensions, including mouse gestures. As such, Opera consumes a lot less memory and hard drive space and doesn't leak memory like a sieve. As with older versions, Opera 9 also includes a mail client that is still revolutionary in that it manages your mail without folders, instead using instant on-the-fly filtering.

Many new features have been added to the beta, including Opera Widgets, or small Desktop applications that appear with a mouse click or by pressing the F6 key. The Widgets use the Opera rendering engine, thus saving memory (compared to other widget engines) if you always have Opera running. You can set browsing preferences on a Web site-by-Web site basis, including ad-blocking and script-blocking, for example. There also is a built-in BitTorrent client and an enhanced IRC client.

Still, what usually sells users on Opera is its speed, and the latest beta remains as fast as ever, even on a slower machine. With nothing to lose, you owe it to yourself to see how another group interprets the term "alternate browser." ▲

Official product name: Opera 9
Version # previewed: 9.00 Beta
Publisher: Opera Software
Developer and URL: Opera Software; www.opera.com
ETA: Q2 2006
Why you should care: "Alternate" browsers keep getting better and better.

UP TO SPEED

Upgrades That'll Keep You Humming Along

This month, Apple implores us to download QuickTime 7.1. Photoshop owners may want to quash the bugs in CS2 9. More adventurous users can finally glimpse at the next generation of Firefox.

Upgrades

Adobe Photoshop CS2 for Windows 9.0.1

This update includes engine fixes for momentary freezes that occurred when using painting tools with quick strokes. Documents with many text layers now open faster, palettes redraw correctly, and sluggish toggling among layer visibility has been cured. Numerous other small fixes and additions round out the release.

Get it at: www.adobe.com

BitComet 0.67

A favorite among BitTorrenters, BitComet has enhanced ICF/UPNP port mapping and cured an instability that occurred when the client received an incorrect packet. UI updates fix detection of Real files in the Video Codec Check Wizard and more.

Get it at: www.bitcomet.com

FeedDemon 2.0.0.23

This is the most recent incremental refresh of the recently released 2.0 major upgrade, which redesigned every aspect of RSS gathering from interface to synchronization.

Get it at: www.newsgator.com

Filezilla 2.2.23

The open-source FTP client/server plugs a critical security hole and fixes a performance problem with multiple-CPU use.

Get it at: filezilla.sourceforge.net

Firefox Bon Echo Alpha 3 alpha

The next version leap for Firefox (still in beta or alpha or whatever) should be available as you read this. This pre-release release offers inline spell checking in form boxes, auto-complete search suggestions for Google and Yahoo!, micro-summaries on Bookmarks, an updated add-on manager, and search services supporting Sherlock and OpenSearch. There are also improvements in previewing and subscribing to feeds.

Get it at: www.mozilla.org

KlipFolio 3.0 (Build 5884-15)

The always-on media-feed app for the Desktop fixes various issues potentially leading to crashes and adds support for more languages.

Get it at: www.klipfolio.com

McAfee AVERT Stinger for W32/Polip 3.0.2

This special version of the standalone malware scanner/repair tool targets the new and tough W32/Polip strain. Due to the strain's nature, eliminating it doesn't always restore the affected files to their original condition, McAfee warns.

Get it at: www.mcafee.com

Paint.NET 2.62

The free paint program now works better in Vista's high-DPI mode and has fixes for font-related crashes, rare crashes involving saving under certain file names, and more.

Get it at: www.eecs.wsu.edu/paint.net

QuickTime 7.1 Mac/Windows

Apple recommends all QuickTime users download this release, which includes many fixes and adds support for iLife '06 and H.264 performance enhancements.

Get it at: www.apple.com

Windows Media Player 11 beta

There's a total remix of the media player we love to hate. WMP11 greatly simplifies the jukebox interface, album art retrieval is improved and automated, and a smart search box anticipates your entries. Also new is MS' answer to the iTunes store via the integrated MTV Urge service.

Get it at: www.microsoft.com

ZoneAlarm Pro 6.5.677.000 Beta

The firewall gets a Gamer's Mode to prevent security measures from interfering with online gameplay. A new Spy Site Blocking feature keeps you from accessing known spyware-installer sites and blocks programs on your system from trying to reach out to rogue sites.

Get it at: www.zonelabs.com

Zoom Player Pro 5.00 Tech Preview 6

The next iteration of the versatile media player completely redesigns the Media Library interface and improves media playback and Windows Media DRM support. Zoom also now has larger skin support, which is good for higher-res displays.

Get it at: www.inmatrix.com

Driver Bay

Logitech SetPoint 2.60 Build 606

Logitech mouse and keyboard owners may want this update for control and customization tools.

Get it at: www.logitech.com

Netgear SC101 Firmware 4.19.0 & Utility 1.5.7

For Netgear's new network storage unit, this software corrects usable space monitoring, fixes system hangs with large transfers to mirrored drives, and fixes possible file corruption when one file is written simultaneously from two computers.

Get it at: www.netgear.com

Nvidia Forceware 83.40 for GeForce Go 7800GTX

Specifically for the recently issued mobile GPU, these drivers are WHQL certified and support most of the notebook manufacturers using the accelerator. (Check the docs first.) These drivers add PureVideo enhancements and features, DirectX 9.0c, and Open GL 2.0 support.

Get it at: www.nvidia.com

by Steve Smith

Twinsanity

Do Hard-Core Users Really Need Multiple Cores?

Install multiples of most computer components and the benefits are immediately obvious. Two monitors for maximum productivity. Two video cards for a killer SLI or CrossFire setup. Two hard drives for massive storage and improved caching. Two CPU cores for superior performance relative to single-core CPUs?

Well, sometimes. Heat and other issues mean you can't clock each core in a dual-core chip at a speed comparable to the fastest single-core chips, which makes dual-core performance extremely software-dependent. Single-core CPUs are actually superior unless you're using apps specifically optimized to take advantage of multiple cores or software that can take advantage of Windows XP's multi-core support. Fortunately for dual-core users, there's plenty of that software out there. I reviewed several leading packages that claim to operate better with multiple cores to get an idea of what to expect for those considering upgrading to a dual-core processor. Note that these aren't full product reviews; all the software here is worthwhile, thus I awarded scores in the context of how well each worked when used with a dual-core CPU.

For testing I used a Windows XP Media Center Edition PC running an Intel Pentium D 820 (dual-core with each running at 2.8GHz), one 7,200rpm SATA hard drive, a 256MB Nvidia GeForce 7900 GT, and 1GB of PC4200 RAM. Aside from the video card, this system is modest by today's standards, but I wanted to maximize strain on the CPU while simultaneously testing to see if even an obsolescent dual-core chip such as the 820 can perform well with software designed to take advantage of multithreading.

Got XP? Get Dual-Core

Before I get to the reviews, it's important to briefly look at WinXP's role in a dual-core environment. The OS is specifically designed to utilize multiple cores, making dual-core computing generally much faster and more stable than with a single-core CPU. Even as I was testing software without multithreading capabilities, WinXP let me ALT-TAB between programs and the Desktop more quickly than when using a single-core setup. Multitasking was also vastly improved because WinXP can divvy up threads from multiple running programs to either core, thus evening the load and dramatically reducing the number of system freezes that CPU-usage spikes cause. In fact, the main problem that dual-core users face is not having enough memory installed; it's possible to run so many programs without bringing the system to its knees that running out of RAM becomes a real possibility.

Applications

Dual-core chips work well in conjunction with content-creation software designed to divide the workload between the two cores. Whether you're working with graphics, making a video, or editing audio, a dual-core CPU should be high on your priority list.

Adobe Creative Suite Production Studio Premium

Not everyone uses every tool in this massive multimedia-editing suite, but if you work with graphics, audio, or video there's a good chance you're familiar with at least one of the apps, including Photoshop CS2, Premiere Pro 2.0, Audition 2.0, Illustrator CS2, Encore DVD 2.0, and After Effects 7.0 Pro. All are designed to work with one another and to take advantage of dual-core processors. Premiere Pro's splash screen even let me know that multiple cores were detected.

Photoshop offers perhaps the best example of how optimized this suite is for dual-core computing. Filters I applied to large images completed faster with both cores enabled than when one core was disabled, and my CPU resources were rarely maxed when using both cores, even though they were consistently pegged at 100% when only one core shouldered the entire burden.

The performance gains I saw in Photoshop carried over to other areas, including faster load times overall, faster rendering times in Premiere Pro 2.0, quicker saves and file conversions in Audition, and smoother performance in After Effects. Best of all, multithreading lets these apps actually work in conjunction with one another. My test system definitely needed more RAM to fully utilize this, but dual-core seems the way to go if you're using Adobe software.

Sony Media Software Sound Forge 8

Sony Media Software could have let Sound Forge rest on its laurels, but with this version it reinvigorated this popular audio-editing package with added support for VST effect plug-ins and ASIO drivers for extremely

Product Information

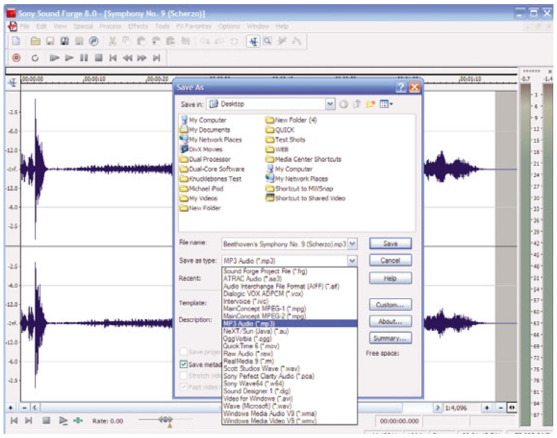
Creative Suite Production Studio Premium
$1,699 (individual components cheaper)
Adobe
www.adobe.com
●●●●◖

Sound Forge 8
$299.96
Sony Media Software
www.sonymediasoftware.com
●●●◖

Adobe Creative Suite Production Studio Premium

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

low-latency digital audio transfers, plus a new audio scrubber tool makes it much easier to navigate tracks during editing. The app is still among the best stereo audio editors available, and the fact that it comes with a free copy of CD Architect 5.2 (perhaps the best CD-creation tool around) is just gravy.


Sound Forge 8

During testing, two cores didn't dramatically increase Sound Forge's objective performance—enabling both cores only shaved a few seconds from single-track conversion times, for example—but subjectively the software was much more responsive with both cores running. Flipping between Sound Forge and other apps was a snap, even when CPU-intensive conversion or compression tasks were in progress. Multiple cores are recommended for the program.

Sony Media Software Acid Pro 6

If you're like many users who feel Acid Pro has languished a bit of late, you haven't tried Acid Pro 6. The big news with this release is multitrack recording, which lets this pioneer of loop-based music editing finally re-enter the heavyweight division. You might think this big technological leap may have come with some teething pains, but the biggest problem I had in testing the dual-core performance was that it was simply too efficient. Even very complex files rarely taxed either core, let alone both of them, but as usual, multitasking was smoother with both cores enabled, and it's nice to know that Acid plays so nicely in a dual-core setup.

Product Information

Acid Pro 6
$374.96
Sony Media Software
www.sonymediasoftware.com
●●●◖

Painter IX.5
$429 ($199 special upgrade pricing)
Corel
www.corel.com
●●●●

Professional Digital Painter
$97
Project Dogwaffle
www.thebest3d.com/dogwaffle
●●●◖

7-Zip
Free
Igor Pavlov
www.7-zip.org
●●●●◖

Corel Painter IX.5

Painter is an outstanding natural media-painting tool, and as with all products in this category, it is a complete resource hog that shines in a dual-core environment. Natural media programs do all sorts of calculations to determine how different things such as paint and chalk all flow into and interact with each other. They must also adjust for various brush types and pressures (with pressure-sensitive tablets) and handle post-processing effects such as making a flat brushstroke look like raised oil paint.

I opened a new file and started painting with both cores enabled. I did the same with only one core enabled. Checking the Performance Monitor to see the differences showed that the Photo Painting feature kept up with my brushstrokes much better with both cores turned on, and processor usage never maxed out. This is very important when using a painting program because if the CPU can't keep pace with your movements, there's stuttering that hurts the final image's quality.

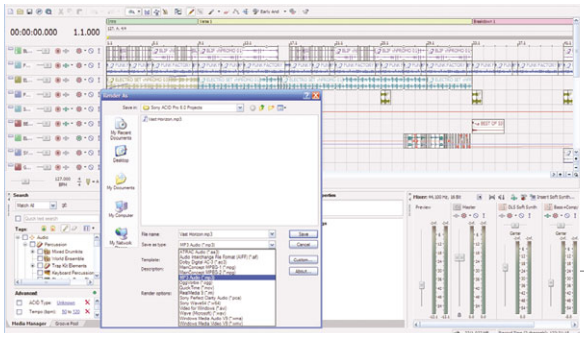
Painter didn't always use both cores as efficiently as a program like Photoshop, and it frequently relied on one core more than the other. The bottom line, though, is that multiple cores are a huge plus if you want to work in real time with this software.

Project Dogwaffle Professional Digital Painter 3

Project Dogwaffle has come a long way from its freeware roots, and Pro Digital Painter is an interesting, inexpensive alternative to natural media painting products such as Painter. The software isn't specifically designed to use multiple cores, but filters and many other features run independently of the main executable. This, in conjunction with WinXP's handling of separate threads, makes for a very efficient program in a dual-core environment. Painting tools, such as oil brushes that maxed out the resources of a single core, ran without a hitch when both cores were enabled, and the software multitasked very well with both cores operating.

Utilities

Multithreading isn't good for everything, but it is perfect for CPU-intensive tasks such as file conversion and compression. Here's a breakdown of some of the top utility software that works best on a dual-core setup.


Acid Pro 6

7-Zip

This compression utility is one of the finest examples of dual-core-optimized software I tested. It

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

handles various compression formats, including Zip, TAR, GZIP, RAR, CAB, ARJ, and the highly efficient eponymous algorithm. The fact that 7-Zip is free sweetens the pot. The real benefit is its ability to seize control of both cores (assuming something else isn't already using the resources) and compress data in far less time than when only one core is on. Average compression speeds nearly doubled when both cores were enabled, and the program used nearly all the CPU resources of both cores.

Apple Computer iTunes

iPods are so popular that lots of people use iTunes to manage their music. In testing iTunes took terrific advantage of both cores. I ripped a 10-track CD, converting it on the fly into 192Kbps VBR MP3 tracks, and the entire process took 1:17 (minutes: seconds) with both cores enabled and both used extensively. When I turned off a core and repeated the test, it took 1:49 to rip and convert the entire CD and maxed out the single core's resources much of the time.

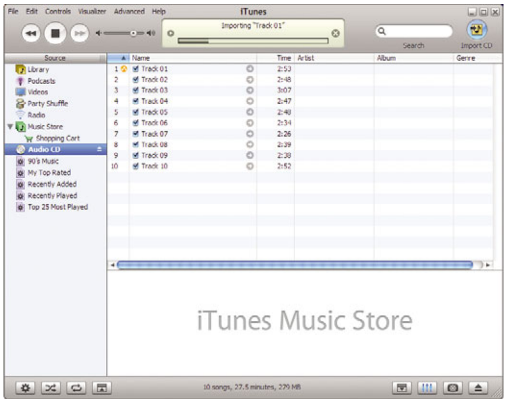
Product Information

iTunes
Free
Apple Computer
www.apple.com/itunes
●●●●◖

DivX Create Bundle
$19.99
DivX
www.divx.com/divx/create
●●●◖

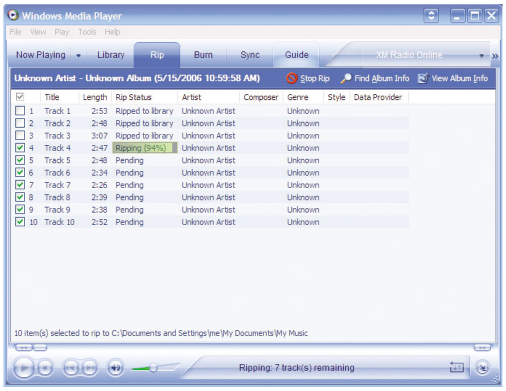
Windows Media Player 10
Free
Microsoft
www.microsoft.com
●●●●◖

Quake 4
$39.99
id Software
www.quake4game.com
●●●●



	Name	Time	Artist	Album	Genre
1	☑ Track 01	2:53			
2	☑ Track 02	2:48			
3	☑ Track 03	3:07			
4	☑ Track 04	2:47			
5	☑ Track 05	2:48			
6	☑ Track 06	2:34			
7	☑ Track 07	2:26			
8	☑ Track 08	2:39			
9	☑ Track 09	2:38			
10	☑ Track 10	2:52			

Apple Computer iTunes



Unknown Artist - Unknown Album (5/15/2006 10:59:58 AM)

☑		Title	Length	Rip Status	Artist	Composer	Genre	Style	Data Provider
☐	1	Track 1	2:53	Ripped to library	Unknown Artist		Unknown		
☐	2	Track 2	2:48	Ripped to library	Unknown Artist		Unknown		
☐	3	Track 3	3:07	Ripped to library	Unknown Artist		Unknown		
☑	4	Track 4	2:47	Ripping (94%)	Unknown Artist		Unknown		
☑	5	Track 5	2:48	Pending	Unknown Artist		Unknown		
☑	6	Track 6	2:34	Pending	Unknown Artist		Unknown		
☑	7	Track 7	2:26	Pending	Unknown Artist		Unknown		
☑	8	Track 8	2:39	Pending	Unknown Artist		Unknown		
☑	9	Track 9	2:38	Pending	Unknown Artist		Unknown		
☑	10	Track 10	2:52	Pending	Unknown Artist		Unknown		

10 item(s) selected to rip to C:\Documents and Settings\me\My Documents\My Music

Ripping: 7 track(s) remaining

Microsoft Windows Media Player 10

DivX Create Bundle

DivX requires a lot of CPU power during conversion, and the latest Create version used two cores to good effect during this process. The software is very light on options, especially compared to Dr. DivX, but the app makes it relatively easy to convert video files into high-def and other DivX formats using a drag-and-drop interface. I converted several files and noted in Performance Monitor that both cores were utilized to the point they were sometimes both maxed out, but more often only about 30% of each core was used. This let me easily work on other tasks during the conversion, especially compared to running the program in single-core mode where other programs became inaccessible at times because of the constant strain on the processor.

Microsoft Windows Media Player 10

Every Windows PC comes with Windows Media Player, so I decided to see how well it could do in creating Windows Media Lossless audio files. The results were pretty impressive. Using both cores extensively to rip and convert a 10-track CD took 1:20, compared to 1:40 for the same operation with one core disabled. More significantly, the single core was 100% utilized during this operation, while the dual-core configuration was used extensively but left about 20% of each core's resources free at any given moment.

Games

Unfortunately, gamers benefit little from dual-core technology today. In fact, most games now run much faster on the best single-core CPUs because they operate at higher clock speeds than dual-core chips do. Additionally, many games that advertise dual-core support don't run any better on dual-core chips than on single-core CPUs. Age of Empires III, Black & White 2, F.E.A.R., Call of Duty 2, and several other dual-core-enabled games I tested simply weren't worth writing about in the context of this article (although the dual-core CPU made multitasking while playing easier). Finally, a video card's GPU limits most games more than the CPU, so in many cases, the best way to improve performance is to install a better graphics card, not a better processor. That said, there are at least a few games available that work better with two cores.

id Software Quake 4

This is one of the most derivative FPS in recent memory, but most Quake fans are looking for killer graphics and a lightning-fast multiplayer, not innovation. Quake 4 delivers in those regards and also happens to be the best game to show off a dual-core setup. Fortunately, a patch added optimizations that gave me an average 10% to 15% frame-rate boost, and you may benefit even more if you're using something more sophisticated than my crude Pentium D 820.

Bethesda Softworks Oblivion

Oblivion is a fantastic and beautiful RPG that eats everything you throw at it

CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

in terms of computer resources and begs for more. You'll get the biggest performance boost by installing an SLI or CrossFire setup, Oblivion still takes some advantage of dual cores, although it's safe to say you aren't missing out on much (if anything) by sticking with an extremely fast single-core chip. The average frame-rate boost on my system was between 5 and 10% (performance indoors was always better than outdoors), and stuttering during play was slightly reduced.

Ubisoft Ghost Recon Advanced Warfighter

GRAW is to FPS what Oblivion is to first-person RPG: a resource-hungry monster designed to frighten wee PCs. GRAW worked a little more smoothly on my dual-core setup than when bypassing one of the cores, but who am I kidding; you need a hella fast video card to go with a hella fast CPU (dual core or otherwise) if you want to keep this one silky smooth.

Croteam Serious Sam 2

As with Quake 4, it took a patch to get this game to take advantage of two cores. Not full advantage, mind you, but good enough that my frame rates went up 10 to 15% on average, so it's definitely worth downloading the latest patch (2.070 at the time of this writing).

Oblivion

More Cores

Although dual-core support isn't widespread now, especially for games, expect big things in the future. Gartner analyst Martin Reynolds predicts that most processors shipped in 2007 will incorporate dual-core designs, making it much more cost-effective for software developers to focus on dual-core enhancements. Both AMD and Intel are working on quad-core designs that may be available by early next year and are even talking eight-core processors a few years from now.

PC gamers should rejoice that the Xbox 360 and PlayStation 3 both use multi-core designs, as this means game developers are quickly becoming familiar with the ins and outs of programming for that environment. It also means cross-platform games should be easier to port from next-gen consoles to the PC without sacrificing much in the way of graphics or gameplay. This is a field where the hardware drives the software, and as multi-core chips get faster, more advanced, and more widespread, ubiquitous software support will certainly follow.

(To see our "Kill The Core" sidebar, go to www.cpumag.com/cpujul06/core.) ▲

by Tracy Baker

Product Information

Oblivion
$49.99
Bethesda Softworks
www.elderscrolls.com
●●●

Ghost Recon Advanced Warfighter
$49.99
Ubisoft
www.ghostrecon.com/us
●●●◖

Serious Sam 2
$29.99
Croteam
www.serioussam2.com
●●●●

Future Apps

Now that multi-core CPUs are getting more powerful and more ubiquitous, developers are finally moving to fully embrace the technology. A full list of upcoming software that can take full advantage of multiple cores would fill several pages, but here are some highlights:

Unreal Tournament 2007

This series has always been known for its ability to leverage bleeding-edge hardware, and the latest entry looks to take full advantage of multiple cores. That's great news for dual-core owners, as many other developers tend to license the UT engine for their projects, which should lead to a slew of games optimized for multiple cores.

Microsoft FSX

The upcoming version in the Flight Simulator series will feature full support for multiple cores. With any luck this will allow for an enhanced physics model and the ability to load third-party add-ons and other in-game tools without bringing the computer to its knees.

Fruity Loops Pro

The developers of this music creation tool say a soon-to-be-released version will take advantage of two or more cores.

Blaze Media Pro

The popular media management, conversion, and playback tool is poised to include dual-core support soon. "We will soon release an upgrade that is specifically optimized and takes full advantage of dual-core and dual processors," says Chris Hoffman, Mystik Media founder. "Enhanced features include video conversion, audio conversion, video editing, audio editing, video constructing, video decompiling, audio merge, video merge, and extracting of audio content from video files."

The Art Of The Multiple-Boot

The Name Of The Game Is "Management"

Sometimes one operating system—or one version of Windows—on your computer just isn't enough. If you're running multiple versions of Windows side by side or maybe experimenting with one of the new breeds of Linux on another partition, you need a way to selectively boot between them without hassle and without having each OS step on the other's toes. Also, with Windows Vista growing ever more polished with each beta build (and with a public test release imminent), many people want to try it, but only if they can so do safely. What you need then is a boot manager, or an application that controls which disks, partitions, and operating systems you want to boot from.

Many boot managers also do double duty as partition-management tools or bundle with these tools. It's probably only right that you can get both program types in the same package. That said, this review focuses mainly on how each package handles boot management rather than partition management per se.

How We Tested

I tested each boot manager program on three machines, including a 766MHz laptop with one 20GB PATA drive split into two partitions, a dual AMD Athlon 64 3000+ system with two 160GB SATA drives, and a set of Virtual PC machines running on the latter machine. I performed most of the basic functionality tests first in the Virtual PCs and then replicated and confirmed these across the other two computers. (Peculiar partition-hiding behavior that I found with Symantec's Partition Magic, for example, was something I checked on all three machines and found to be consistent.)

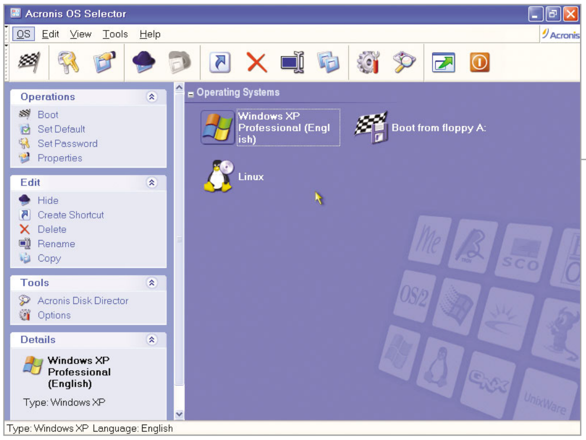
Acronis Disk Director Suite 10.0 (With OS Selector)

Acronis' OS Selector comes with the Disk Director Suite, which contains a full gamut of disk tools and a boot manager. Unlike many other boot managers here, however, OS Selector doesn't require a dedicated boot partition; it can install on an existing FAT, FAT32, or NTFS partition and work from there. This makes it a lot less obtrusive than other programs that require you to create or set aside an existing partition specifically for them.

When you install Disk Director Suite, you're also presented with a Windows version of OS Selector. From there you can configure the boot/partition options or reboot the system directly into another OS (for instance, from CD or on another disk). If you want to configure an existing system with multiple OSes already on it, an OS Detection Wizard attempts to pull information about existing OSes from specific partitions, the MBR (master boot record), or from a currently inserted CD. The software can load boot sectors for a given partition from the partition itself or from a file. Amazingly, the program's user interface is exactly the same in all versions, including in Windows, in the OS boot menu, *and* on the boot CD.

Acronis gives you a great deal of control over an operating system's boot parameters. The best of these features lets you associate not only specific disks or partitions but files and folders with a given operating system. For example, this ability lets you run multiple copies of Windows side by side on the same partition without having them conflict with each other. You can also opt to forcibly hide partitions from the OS (to avoid conflicts with older and newer editions of NTFS, for example; see the "Multi-Boot Tips" sidebar for more.).

Aside from the Disk Director disk-management product, Acronis also packs



Windows XP Professional (English)
Type: Windows XP

Type: Windows XP Language: English

Disk Director Suite 10.0
$49.99
Acronis
www.acronis.com
●●●

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

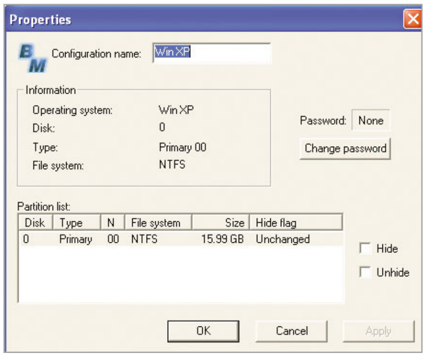
a bootable CD image called Rescue Media, which is loaded with a great many tools. OS Selector is included so you can outfit a system with OS Selector without having to boot it first. There are also two versions of Disk Director, one with full device support (USB, SCSI, etc.) and another with a minimal driver set. Both versions include the same toolset, including partition editors, disk repair utilities, and a file explorer. One big limitation of the file explorer is that it works with text files only; you can't edit binaries.

I had some quibbles with the software, but they weren't major. Booting Linux from a CD didn't work initially. I eventually settled for setting the system BIOS to boot from CD first to work around this, so I suspect the problem was my system and not the program (it worked fine on another computer). Also, at boot time OS Selector takes a little longer to come up than the other programs described here, but this is only going to inconvenience the truly impatient; it's only a second or two as opposed to a fraction of a second.

Paragon Software Group Partition Manager 7.0/BootManager

Paragon bundles BootManager with its Partition Manager application, and as you might guess, Partition Manager is a disk and partition suite of the same stripe as many of the others reviewed here. BootManager has both a Windows component (the boot menu configuration app) and the boot loader itself, which is a basic character-mode menu—not as fancy as some of the others here but perfectly serviceable.

When you want to add a new menu choice to BootManager, you have four options: copy an existing menu item, use an external boot sector file, add an as-yet-unrecognized OS on another partition, or use an option labeled Split Boot.ini file. The last option isn't properly documented in the program's manual at all, but it appears to be a way to add a boot menu entry from one of the multiple entries in an existing Boot.ini file. You can't add an option to boot directly to CD, but you can add the original, unmodified MBR as a boot menu option—a handy option if you want to preserve as closely as possible the boot behavior of the system before you installed BootManager. If you have Linux's Lilo/Grub boot managers present, you can also elect to ignore them and boot directly into Linux or boot Lilo/Grub first.



Configuration name: Win XP

Information
Operating system: Win XP
Disk: 0
Type: Primary 00
File system: NTFS

Password: None

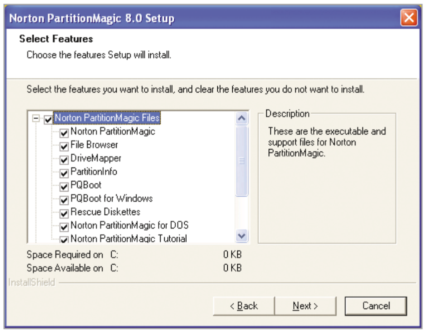
Partition list:

Disk	Type	N	File system	Size	Hide flag
0	Primary	00	NTFS	15.99 GB	Unchanged

☐ Hide
☐ Unhide

Partition Manager 7.0/BootManager
$49.95
Paragon Software Group
www.paragon-gmbh.com
● ● ●

When you want to add a new OS to an existing drive, BootManager has a mini-wizard to let you do exactly that. Run it and you can select a source medium and a target partition, and the system will reboot directly to the target media and start the installation. Note that you'll need to create a target partition if you don't have one available for it yet. Also, CD and floppies are the only source media supported, but that's not much of a problem.



Select Features
Choose the features Setup will install.

Select the features you want to install, and clear the features you do not want to install.

☑ Norton PartitionMagic Files
  ☑ Norton PartitionMagic
  ☑ File Browser
  ☑ DriveMapper
  ☑ PartitionInfo
  ☑ PQBoot
  ☑ PQBoot for Windows
  ☑ Rescue Diskettes
  ☑ Norton PartitionMagic for DOS
  ☑ Norton PartitionMagic Tutorial

Description
These are the executable and support files for Norton PartitionMagic.

Space Required on C: 0 KB
Space Available on C: 0 KB

Norton PartitionMagic 8.0/BootMagic
$69.95
Symantec
www.symantec.com
● ● ◖

The single biggest problem with the program is localization. Paragon is a German company, and the English translations of both the manuals and the program's own prompts and dialog boxes are rather stilted. Statements such as, "Do you want to apply settings before quit?" and "Menu item existed" (instead of, I guess, "Existing menu item") are rampant throughout. These don't make the program unusable, but they can be puzzling.

Symantec Norton PartitionMagic 8.0/BootMagic

Symantec's PartitionMagic disk-management suite, which includes the BootMagic boot manager utility, is actually a Symantec acquisition; Symantec bought PowerQuest, the application's original manufacturer, and put the Symantec label on it. Unfortunately, many of the problems with earlier versions seem to have been carried over intact, and BootMagic is also not as robust in its features as compared to the other programs here.

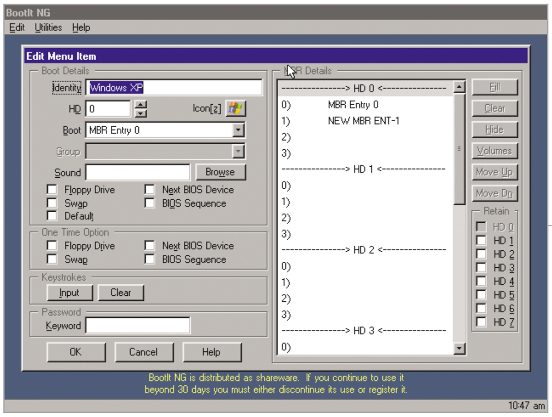
The first problem I ran into will apply to most Windows XP users. BootMagic can't be installed unless there is at least one FAT/FAT32 partition available for it, so you need to set up PartitionMagic and create a partition for BootMagic to reside on. Once you create the partition and install the program, though, another issue (documented, but not very well) will affect WinXP users with a primary NTFS partition.

The program's default behavior is to hide any non-NTFS partitions when booting to an NTFS partition. Unfortunately, this means BootMagic hides its own FAT partition when you boot into WinXP, so you need to manually override this to edit the program's own configuration. What's worse, you're not really warned about this when you install the program, so if you try to make changes to BootMagic after the partition's already been hidden, you'll need to unhide the partition manually.

There are no options within BootMagic's main boot menu to control partition hiding behavior, either, and you can't even uninstall the program if the partition has been hidden (BootMagic uses Windows Installer and refuses to run the uninstallation routine if it can't find the files). The only way to get around this is to boot the program CD, run BootMagic from there, and turn off FAT partition hiding for your Windows installation. The PDF file included with the program talks about this problem in a little more detail under the heading Configuring BootMagic To Work On An NTFS System. If you plan on using BootMagic with WinXP, read this carefully.

I also ran into a slew of other, little problems in PartitionMagic and BootMagic. If you want to resize the left edge of your OS partition—for example, put space at the end of a drive—the program doesn't always realize that this needs to be done after a reboot, and the operation fails. This isn't well-documented and doesn't happen very consistently, either. I had to work around it by adding a command to resize the right edge of the partition first (which does force a reboot).

Problems like these make it tough to recommend BootMagic, especially considering that the other programs here aren't as quirky and offer as many or more features for the same money.



Identity: Windows XP
HD: 0
Boot: MBR Entry 0

```
---------------> HD 0 <---------------
0)          MBR Entry 0
1)          NEW MBR ENT-1
2)
3)
---------------> HD 1 <---------------
0)
1)
2)
3)
---------------> HD 2 <---------------
0)
1)
2)
3)
---------------> HD 3 <---------------
0)
```

BootIt NG is distributed as shareware. If you continue to use it beyond 30 days you must either discontinue its use or register it.

BootIt NG 1.76
$34.95
Terabyte Unlimited
www.terabyteunlimited.com
●●●●◖

Terabyte Unlimited BootIt NG 1.76

I've sung the praises of BootIt NG before, and for good reason: This is one of the best pieces of shareware around, period. A combination boot manager, disk/partition editor, and disk-cloning utility suite, you can download BootIt NG as a 30-day trial and use it without restriction. The price ($34.95 for single use; bulk discounts available) is also highly competitive.

The main attraction of BootIt here is the application's OS loader, which is extremely easy to install. In fact, you're given the option to install the boot loader the first time you run the program, and it's quite painless and self-documenting. You can opt to install BootIt to its own partition or into the MBR, and all the choices (and their consequences) are clearly explained in the product's online and paper documentation. You can boot up to eight partitions per disk, and you can boot between seven physical disks in the same system. This flexibility does come with one caveat: If you use all eight partitions on a disk, you can't use any other boot loader except for BootIt.

Aside from adding individual partitions or OSes to the boot menu, you can also configure alternate device boot options. For example, you can set up a menu option to boot directly to CD even if you don't have CD booting enabled in your system BIOS. Another option lets you boot directly to whatever device is listed next in your BIOS setup. Both options are handy if you always want to run

Boot Managers: From Heel To Toe

We slipped on five different boot managers and took them for a stroll to see what kind of comfort and durability they could provide. For the most part, we were pleased with how comfy and well-made the apps were, although a few programs did give us an occasional blister or two. Here's how they compare.

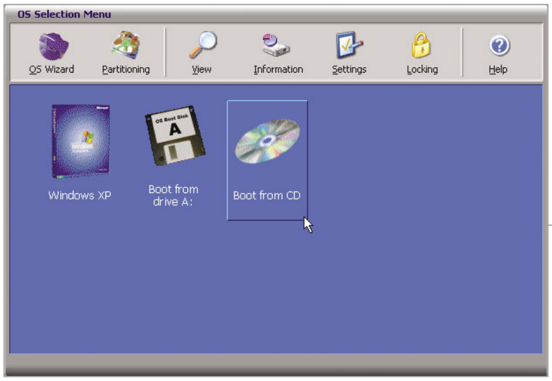
	Acronis Disk Director Suite 10.0	Paragon Software Group Partition Manager 7.0/BootManager	Symantec Norton PartitionMagic 8.0/ BootMagic	Terabyte Unlimited BootIt NG 1.76	V-Com System Commander 8
Requires its own partition	N (Installs on FAT/NTFS)	N	Y	N (installs in MBR)	N
Password protection for entries	Y	Y	Y	Y	Y
Multiple OSes on the same partition/folder hiding	Y	N	N	FAT16/FAT32 only	Y
Boot directly to CD/DVD as menu option	Y	N	N	Y	Y
Boot to other devices in BIOS chain	N	N	N	Y	N
Boot raw partitions directly	N	N	Y	Y	Y
Conceal partitions	Y (optionally automatic)	Y	Y (automatic by default)	Y	Y
Bootable rescue media	Y (multiple versions)	Y	Y	Y	Y
Deactivate without uninstalling	Y	Y	Y	Y (hide menu only)	Y
MBR antivirus checking	N	Y	N	Y	Y

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

BootIt first and then be able to elect to boot from CD. You can also create and save multiple boot menus.

Another nice feature is the ability to boot multiple OSes from the same partition, although this feature is specifically for FAT16/FAT32 partitions. However, BootIt doesn't make any automatic compensation for multiple copies of the same OS that try to use the same folders, such as Windows 98 and Windows Me both contending for Program Files. The program does explain how to work around this, though, and you can still use the Multi-OS feature (as it's called) to make this easier.

The program's disk utility portion is also excellent, and I've relied on it many times to do such things as clone existing disks or partitions without trouble.



System Commander 8
$69.95
V-Com
www.v-com.com
●●●◖

V-Com System Commander 8

V-Com's System Commander was one of the first boot manager tools for the PC, and it's remained one of the best for various reasons. The most compelling reason is how much guidance it provides a user when he wants to add an OS to an existing computer while preserving everything else.

System Commander doesn't need a dedicated partition to run, and like many of the other applications here, it has both Windows and DOS-mode editions. The Windows program is relatively limited; it only lets you create boot media, enable or disable System Commander, and change some very general program settings. The enable/disable option has a nice feature in that you can either disable the program temporarily and restore the original MBR or remove everything.

When you reboot the computer and get the actual System Commander menu, you have access to a broader range of options. The OS Wizard that's available from that menu is an outstanding tool; it lets you install a completely new OS from bootable media and will even create a new partition to hold it for you. If you only have one partition available, you can nondestructively resize it to make room for a new one. In the event the OS installation doesn't work and your boot sector is damaged, you can throw in the program's boot diskettes or bootable CD, repair, and pick up where you left off.

People with more than one version of Windows 9x will adore the MultiFAT feature, which lets you run multiple DOS-based OSes—DOS itself, Win95, Win98, and so on—all on a single partition without having them conflict with each other by sharing fixed directory names (such as Program Files or Windows). This is only available when System Commander is installed from one of those OSes. Also, one of the program's default functions is that if you have more than one NTFS-compatible edition of Windows (such as Win2000 and WinXP), System Commander automatically hides each from the other to prevent NTFS version-compatibility problems. This isn't hard to modify, though.

As an added bonus, System Commander comes with a copy of the Scout Diagnostic utility (available through the Windows program menu); the reports it generates can be useful for debugging any issues you might come across. ▲

by Serdar Yegulalp

Multi-Boot Tips

Be cautious when using boot managers with multiple operating systems; there are some quirks that not all of these programs are aware of. Here are some of the most common:

1 **Be wary of multiple versions of NTFS.** Windows NT/2000/XP/2003 use slightly different versions of NTFS that aren't upwardly compatible. If you have a Win2000 computer that you install WinXP on, the NTFS partitions in the system are converted to the most recent version. If you boot Win2000, disk-checking tools won't work. Some programs (such as System Commander) hide multiple NTFS partitions by default to prevent this problem.

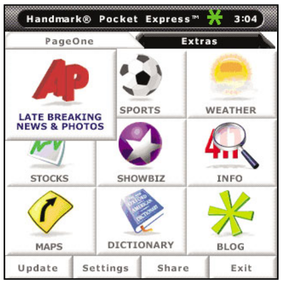
2 **Don't change system drive letters if possible.** Windows system or application drive lettering should always remain consistent. If you add new partitions to boot between OSes, keep your Windows drive letter the same.

3 **Beware of conflicts with products such as Norton GoBack.** The popular system-restore product Norton GoBack writes its own information to the MBR. Most boot managers also write to the MBR, so if you use GoBack, check to make sure any boot manager you use won't conflict with it.

4 **Check your BIOS settings for CD booting.** If you're using a program that lets you manually boot from CD, set your BIOS to always boot from the hard drive first so that your boot manager can kick in.

by Warren Ernst

Handmark Pocket Express 3.0



Pocket Express 3.0
$6.99 a month; $69.90 annually
Handmark
www.handmark.com
●●●●◖

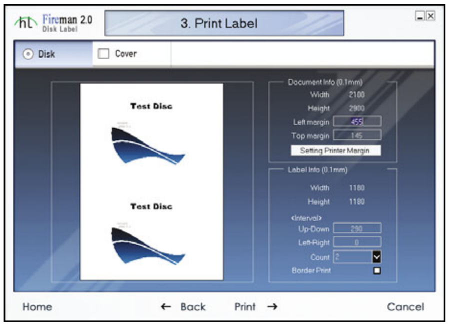
If you spend a few hundred dollars on a wireless communications device and pay $20 to $40 more a month for unlimited wireless data, you'd think you'd be awash in nearly instantaneous Internet-based info at any time and from any place. Obviously, this isn't the case for several reasons, including wireless bandwidth not being that fast, Web sites intended for large screens being hard to view on tiny screens, various Flash/Java/JavaScript support issues, and more. An elegant solution is Pocket Express, which combines a snappy application with a wealth of online content that's tailor made for portable devices. There are a few caveats, but this is the wireless portable Internet you've been waiting for.

PE is available for BlackBerry devices and Palm OS, Windows Mobile, Symbian, and J2ME devices. Remarkably, the UI is nearly identical among them all. The main screen is divided into a 3 x 3 grid with small command buttons such as Back and Update along the bottom and a menu bar at the top. You can tap a button on touchscreen-equipped devices or use hardware buttons to select such main topics as News, Stocks, or Maps and then dig deeper by scrolling. The depth of content available is surprising, including weather with radar maps, movie times with online ticket purchasing options, and News of the Weird.

PE is lightning fast, as it only downloads small chunks of text and headings or highly optimized, presized graphics in the case of photos, maps, or icons. You can accomplish the same tasks with a list of Internet bookmarks pointed at mobile-optimized Web sites, but this solution isn't one hand-compatible or nearly as fast or convenient.

Such benefits come at a price. The PalmOS version consumes 3.5MB of RAM and costs $6.99 a month or $69.90 a year, although you can use News, Sports, and Weather free after the free trial ends. The trial period will likely get you hooked, so exercise caution. ▲

Honest Technology Fireman 2.0 CD/DVD Burner



Document Info (0.1mm)
Width 2100
Height 2900
Left margin 455
Top margin 145

Label Info (0.1mm)
Width 1180
Height 1180
<Interval>
Up-Down 290
Left-Right 0
Count 2
Border Print ☐

Fireman 2.0 CD/DVD Burner
$39.99
Honest Technology
www.honestech.com
●●●

Windows, plus most CD/DVD burners, comes with rudimentary disc-writing software that's usually enough to get you by but not much else. Those looking for more functionality traditionally have had two options: free-but-complex solutions or commercial apps that are usually easier but cost around $80 or so. In the middle is Honest Technology's Fireman 2.0. It combines a good set of features with a simple interface and splits the cost difference at $40.

Fireman divides burning tasks into such categories as Files, Audio, Video, and Utilities, and each category gets an icon on the main screen. Clicking an icon drills down to more icons until you get to a file-selection screen that's reminiscent of Nero's. Just select the files you want or drag and drop them from other open windows and click the Burning button and you're off. Making audio CDs and VCDs or DVDs from precompiled project files is similarly simple. Other utilities such as label printing and CD-RW erasing are available via the Utilities icon.

Fireman works as advertised, but you rarely forget that it's an in-between package. There's no significant Help file other than Help screens that merely list the on-screen commands for every window. Need to know what "finalizing" a disc means or what "multisession" discs are? Try Google. The fonts on many screens are a tad too large, and you can't resize most windows to compensate. When printing labels you must measure exactly where your labels are positioned on the sheet or experiment with direct-to-CD printing with blank discs. There's no mention of which video formats are compatible with the VCD functions, although trial and error revealed MPEG worked well.

Over time, using Fireman becomes second nature, and the app burns discs quickly and reliably. For those not ready to shell out $80 for a full package or those unwilling to learn the arcane commands of free programs, Fireman may just rescue you. ▲

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

by Kevin Savetz

iWork '06

iWork '06
$79
Apple Computer
www.apple.com/iwork
●●●◖

iWork '06, Apple's second-gen productivity suite, includes Pages 2 and Keynote 3. Pages focuses as much on designing documents as on word processing. Included templates let you create stationery, invitations, term papers, etc. This version adds two dozen templates (now totaling nearly 70), including marketing materials and newsletters. Also new is the ability to create calculated tables and 3D charts. These features can't approach Excel's many features, but they'll let you present data in a colorful, easy-to-read format.

Also new is Reviewer Comments for adding notes in margins and Mail Merge, which is integrated with the Mac OS Address Book. Following the seemingly simple directions in the PDF manual, however, I couldn't get even one address automatically included in a letter. Integration with other apps was solid, though. Pages can't match Microsoft Word's enormous feature-set, thus it's probably not the best fit for professional writers. And while customizable auto-correction is a welcome addition, indexing functions, macro tools, and the ability to see a word count for a portion of a document are still notably missing from the app.

Conversely, Keynote 3 knocks its competitor, PowerPoint, up against the ropes. The presentations Keynote creates via elegant transitions, beautiful backgrounds, and animations are stunning. The app also includes new themes designed to fit 1,920 x 1,080 high-def displays. Like Pages, Keynote adds auto-calculated tables and Reviewer Comments, this time via on-screen sticky notes. The best addition may be Interleaved Bullet Builds, which let you have a visual element appear alongside a bullet point and then disappear as you move to the next point. Relative to PowerPoint, Keynote is easy to use and offers intuitive integration with iPhoto, iTunes, and QuickTime movies.

Overall, Pages is a solid word processor with decent features for making great-looking layouts. Keynote makes giving presentations (and sitting through them) more than tolerable. Both programs are non-threatening on the face, but the digital manuals reveal features that aren't so obvious. Unfortunately, printed documentation is limited to slim booklets. ▲

iLife '06

iLife '06
$79 (bundled with new Macs)
Apple Computer
www.apple.com/ilife
●●●●

The iLife '06 suite turns any Mac into a multimedia powerhouse. Included with new Macs ($79 separately), iLife is practically a necessity for any Mac user who uses a digicam or digital video camera.

The iMovie HD tool lets you do high-def video editing. Version 6 adds real-time video effect previews and cool new audio effects. (A fast rig will provide better enjoyment; my aging G4 desktop upgraded to 1.2GHz sometimes played back jerky video.) iDVD 6 lets you burn your movies to DVD. This version supports widescreen output and (finally) burning with DVD drives other than Apple's SuperDrives. iPhoto remains the tool for managing digital photos. Version 6 boosts the library's maximum size to 250,000 photos and is noticeably faster than the previous version. A new full-screen editing mode lets you better fine-tune photos, and an effects palette adds edge effects to the sepia and other coloring effects from earlier versions. Also handy is Compare, which displays up to eight images side by side so you can select the best ones. A new Photocasting feature lets you publish images online for public or private viewing, but it's only available if you sign up for a .Mac account.

iWeb, a new app for creating Web sites and blogs "in minutes," starts you off with a list of templates, but there are only a dozen, with such themes as Road Trip and Baby. iWeb outputs beautiful Web sites, though, and lets you publish photo albums and podcasts easily. Anyone beyond newbie Web publishers will find its limitations constraining, however, as it doesn't do a good job of optimizing images for quick downloading, and publishing a site without a .Mac account takes more steps than seems necessary.

GarageBand, the suite's audio tool, now includes a podcast recording studio and the ability to record iChat conversations, which Apple suggests for doing podcast interviews. Relatively few people used GarageBand 2, despite it being a nifty music tool, but with these podcast-creation tools, GarageBand 3 should be useful to many more people.

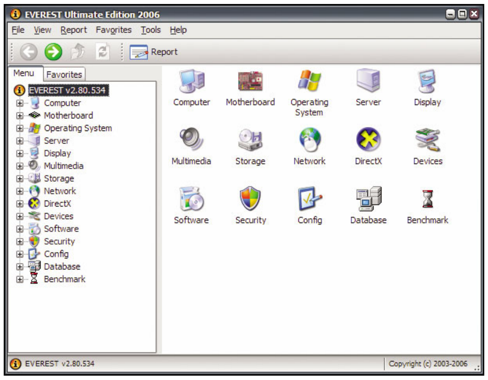
iWeb and GarageBand aren't for everyone, but the other additions to iLife's core apps are well worth the price. ▲

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

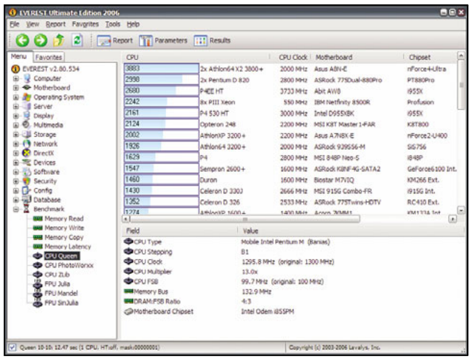
by Marco Chiappetta

Lavalys Everest Ultimate Edition 2006

Everest Ultimate Edition 2006
$29.95
Lavalys
www.lavalys.com
●●●



Everest Ultimate Edition 2006 has a clean, easy-to-use interface; even the most inexperienced user will be able to navigate through the application's various menus.



CPU		CPU Clock	Motherboard	Chipset
3883	2x Athlon64 X2 3800+	2000 MHz	Asus A8N-E	nForce4-Ultra
2998	2x Pentium D 820	2800 MHz	ASRock 775Dual-880Pro	PT880Pro
2680	P4EE HT	3733 MHz	Abit AW8	i955X
2242	8x PIII Xeon	550 MHz	IBM Netfinity 8500R	Profusion
2161	P4 530 HT	3000 MHz	Intel D955XBK	i955X
2124	Opteron 248	2200 MHz	MSI K8T Master1-FAR	K8T800
2002	AthlonXP 3200+	2200 MHz	Asus A7N8X-E	nForce2-U400
1926	Athlon64 3200+	2000 MHz	ASRock 939S56-M	SiS756
1629	P4	2800 MHz	MSI 848P Neo-S	i848P
1547	Sempron 2600+	1600 MHz	ASRock K8NF4G-SATA2	GeForce6100 Int.
1460	Duron	1600 MHz	Biostar M7VIQ	KM266 Ext.
1430	Celeron D 330J	2666 MHz	MSI 915G Combo-FR	i915G Int.
1352	Celeron D 326	2533 MHz	ASRock 775Twins-HDTV	RC410 Ext.

Field	Value
CPU Type	Mobile Intel Pentium M (Banias)
CPU Stepping	B1
CPU Clock	1295.8 MHz (original: 1300 MHz)
CPU Multiplier	13.0x
CPU FSB	99.7 MHz (original: 100 MHz)
Memory Bus	132.9 MHz
DRAM:FSB Ratio	4:3
Motherboard Chipset	Intel Odem i855PM

Queen 10-10: 12.47 sec (1 CPU, HT:off, mask:00000001)

Copyright (c) 2003-2006 Lavalys, Inc.

A number of the synthetic benchmarks available within the application provide a diverse array of results for reference and comparison.

Lavalys' relatively affordable Everest Ultimate Edition 2006 software should intrigue those power users and hard-core enthusiasts looking for a new diagnostic and benchmarking tool to add to their arsenals. EUE2006 has been available for a few years, but with the 2006 release, Lavalys has added a handful of new features to the application, including a new memory copy benchmark, a CPU cache and memory benchmark routine, RAID array member disks enumeration, an improved disk benchmark module, and full support for Intel's latest dual-core Centrino mobile platform technology.

Although you can use many of the tools incorporated into EUE2006 to gauge the relative performance of various subsystems—including the CPU, memory, cache, and disks—the application suite isn't meant just for benchmarking. Numerous other options that are available within the program offer up a host of useful information regarding a system's operating system and installed software and hardware. For example, the software gives you access to low-level information about your motherboard, chipset, BIOS settings, DRAM timing, and CPU instruction set support. The software also displays information about a system's storage devices, network adapters, sound cards, and input devices, including NIC MAC addresses; IP and DNS listings; network traffic statistics; and DirectSound, DirectMusic, and DirectInput information. Even data regarding miscellaneous hardware, such as PC Card slots, USB devices, communication ports, and printers, is available, as is a system uptime monitor, BSOD counter, and handy list of product keys mined from the Registry.

Additionally, EUE2006 features hardware-monitoring functionality. The application isn't universally compatible with every piece of hardware, as there's no standard for sensor chip register layout, but on the handful of systems I tested the program on (including a Centrino-based notebook), Everest Ultimate Edition 2006 reported accurate data regarding CPU core temperatures and various system voltages. While the program is running, Sensor icons display real-time system temperature and voltage values in the System Tray. The hardware-monitoring functionality, in conjunction with the program's handful of CPU and memory benchmarks, will likely appeal to overclockers most.

I'd characterize the various benchmarks in the suite as light-duty tests designed to determine whether a particular component is performing at its specified level. These are similar to the tests that SiSoft Sandra includes. For example, Everest offers results of its FPU Julia test as a simple score. A 3.73GHz Pentium 4 Extreme Edition test machine, for example, scored a 2054 in this benchmark. A score of 2054, however, doesn't really tell a user how the system will perform in F.E.A.R, although if a similarly configured system scored much higher, a user would know something was amiss. Scores are reported in an easy-to-read graph along with scores from numerous other systems in the program's large database. You can also compile the data that Everest gathers into custom reports that you can easily print or output as HTML documents.

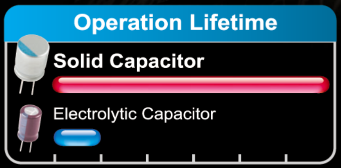
Everest Ultimate Edition 2006 isn't a replacement for a well-balanced suite of real-world benchmarks and hardware-monitoring tools, but it is a handy application for gathering data about a system and quickly assessing relative performance. Considering the vast number of individual data mining, diagnostic, and benchmarking options that EUE2006 includes, it's easy to justify paying the sub-$30 price tag. ▲

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

GIGABYTE Ultra Durable 6-Quad Motherboard

The Industry's Leading All-Solid Capacitor Motherboard Design

- Durability Enhanced



- 6-Quad Features

Quad BIOS | Quad Cooling | Quad Triple phase | Quad eSATA2 | Quad Core Ready | Quad DDR2 slots

6-Quad Edition

GA-965P-DQ6 Durability Enhanced

Intel® P965 + ICH8R Chipset

- Supports Intel® Core™2 Duo processor
- First Quad BIOS solution for Multiple protection
- Industry's leading all solid capacitor motherboard design
- Dual PCI-E graphics interface for extreme gaming performance
- Supports high performance Dual Channel DDR2 800 memory
- Features SATA 3Gb/s with Quad eSATA II interface
- Home theater quality 8-channel High Definition Audio
- Optimized PCI-E Gigabit LAN and IEEE 1394 connectivity
- Complete cooling solution with Silent Pipe and Crazy Cool

Windows VISTA Ready *

S series

GA-965P-DS4 Durability Enhanced

Intel® P965 + ICH8R Chipset

- Supports Intel® Core™2 Duo processor
- Industry's leading all solid capacitor motherboard design
- Dual PCI-E graphics interface for extreme gaming performance
- Supports high performance Dual Channel DDR2 800 memory
- Features quality 8-channel High Definition Audio
- Optimized PCI-E Gigabit LAN and IEEE 1394 connectivity
- Complete cooling solution with Silent Pipe and Crazy Cool

Silent-Pipe | Speed | Smart | Safe

Windows VISTA Ready *

* Windows VISTA Ready Requirement : • High Definition Audio • DirectX 9.0 VGA

P965 available after June 5th.

Learn more about the Ultra Durable 6-Quad Motherboards at www.gigabyte-usa.com

Mwave	NCIX	Newegg	TigerDirect	Zipzoomfly	Fry's Electronic	Micro Center	PC Club
www.mwave.com	www.ncix.com	www.newegg.com	www.tigerdirect.com	www.zipzoomfly.com	www.outpost.com	www.microcenter.com	www.pcclub.com

GIGABYTE™
TECHNOLOGY
20th Anniversary

Copyright © 2006 G.B.T. Inc (U.S.A.). All rights reserved. GIGABYTE Technology is a registered trademark of GIGABYTE Technology Co., LTD. in the United State and/or other countries.

Dialogue Box

I Am FAT32

by Chris Pirillo

For my eighth-grade graduation, I was required to wear a suit. As we didn't have one on hand, my mother (like any good mother from the Midwest would do) took me to the local Sears department store. I was fitted in a jiffy, but not before the salesperson informed my mother I was "husky." From that moment forward, I've been quite self-conscious about my weight. I didn't do much about it until I ballooned to the high 160s after college. For your information, I'm 5-foot 5 inches tall—and that's an overweight weight. What's this got to do with software? Bear with me; it's difficult to admit your shortcomings in such a public fashion.

I did the low-carb thing before it was en vogue, dropping down to an impossible 125 pounds. Over time, I settled in the mid 140s, an ideal range for my body. Years later, I crept back up to the high 160s. I was depressed, but my fiancée offered fantastic moral support in helping me trim down to 142. Fast-forward to today: I'm 32 and "fat." This time, I topped out in the mid-170s. Ouch. I'm not doing this again—ever. No diets. No pills. No gimmicks. It's time for a permanent lifestyle change.

And I'm using technology to help get there.

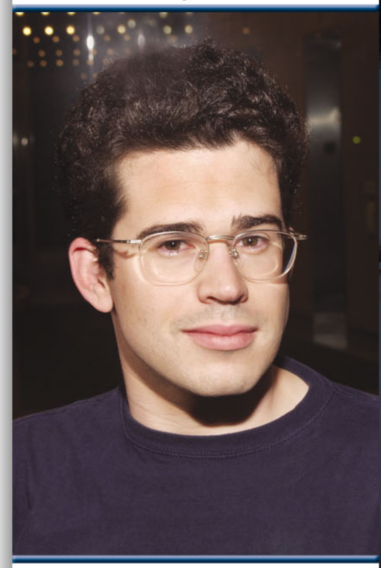
The first thing I did was admit that I had a problem—on my blog. The title of my post was "Captain 173" (a cute li'l rank I always place in front of my weight for some unknown reason). Meanwhile, I was setting realistic goals and game plans to make the post less about pity and more about resolve. The Gazelle and Ab Lounge combination is perfect for someone like me who doesn't really like to exercise for the sake of doing it (in case you're wondering what helped me get to 142 in my last loss).

The second thing I did was start a discussion list for those of us who wanted a private community that's easily accessible and quite informal. If you search the Web for "fat-blasters," you'll find us, and you can join in the fight against being overweight. In just two weeks, small success stories and admissions were pouring in—positive tales of how people were approaching their environment differently thanks to this list. Using the Internet to motivate yourself to do anything? Priceless.

The third thing I did was make sure the workout room had everything I needed to push through 40 minutes of gliding and five minutes of crunching, including a television and a wirelessly-connected Xbox 360. Now, I have access to all my recorded shows and a growing set of time-passing games. Yeah, it's not always easy to work a controller when your legs are swinging back and forth, but I've done PGR and Geometry Wars without hurting myself. Besides, I've found that when I play video games while working out, I really work up a sweat. I've also Gazelled while playing my PSP. Don't ever count on something being "on" when you're working out; if you're doing nothing but flipping channels, those 40 minutes will seem like 40 hours.

The fourth thing I did was go back to a site I had unearthed a while ago, CalorieKing.com. It's a fantastic resource for all sorts of nutritional information. The search feature is easily accessible, and they really don't do any hard sells for their service. They recently upgraded their desktop software (for Windows and Mac OS X), Nutrition & Exercise Manager. I downloaded it and was blown away; within minutes of using it, I whipped out my credit card and paid the registration fees. It's so brain-dead simple to use, and yet so incredibly detailed and organized. I drag and drop items from one column to another, and it'll tell me what I've done in the day to that point, including a breakdown of calories, fat, protein, carbohydrates, exercise, liquids, etc. Then, there are the various other charting features throughout the program. At day's end, I can export everything in CSV, too. I'm losing weight the geeky way. NutritionData.com and FitDay.com are also worth checking out.

The fifth thing I did was . . . run out of room on this page. If you'd like to continue the conversation and offer mutual moral support in this blasted fat plight, I'm formally inviting you to join the discussion list. ▲



Chris Pirillo lost 8 pounds in his first two weeks of daily exercise and calorie watching. He plans on making 145 by the time Gnomedex 6.0 rolls around, his annual conference in Seattle. By his wedding day of 11/11/2006, he hopes to be just as healthy. By continuing to blog about his experiences through chris.pirillo.com and Lockergnome.com, he's finding it easier to stick to his goals. When searching for a good pedometer, he looked on www.gada.be in the Shopping category and was told that the Omron HJ112 Premium Pedometer was the one to beat.

> Yeah, it's not always easy to work a controller when your legs are swinging back and forth . . .

You can dialogue with Chris at chris@cpumag.com.

Open Sauce

Red Hat, Revisited

by Pete Loshin

One reason that Red Hat and Linux are inextricably connected is that for years Red Hat Linux (www.redhat.com) was the only shrink-wrapped alternative to Windows that you'd ever see on the shelves of your local big box store. Once the folks at Red Hat realized that the big bucks in the software business were in selling enterprise software, they switched to selling serious software for serious money.

When Red Hat stopped selling consumer editions, it needed to appease a very important community of users: technically skilled users who installed and supported Red Hat Linux on desktops and servers—those who expanded Red Hat's installed base and often contributed to open-source projects but who didn't buy the software or support. So it forked Red Hat Linux.

For the suits—the paying customers at large corporations—Red Hat sold annual subscriptions to a high-end, reliable, robust, and certified RHEL (Red Hat Enterprise Linux) for as much as $2,499 per server. For that, you get compiled binaries, documentation, support, updates, and bug fixes. But perhaps most important for corporate customers, Red Hat revises RHEL on a strict 18-month schedule and supports each release for a full seven years. No forced upgrades, and IT departments can plan their budgets far in advance.

For the geeks—the people who spread the good word about Linux—Red Hat created the Fedora Core (fedoraproject.org), a noncommercial, open-source operating system project whose aim is to produce a reasonably reliable, robust, and stable distribution of Linux, but that may include more cutting-edge stuff that might eventually find its way into RHEL. As a sort of beta program, Fedora Core updates come out two or three times a year, significantly more often than RHEL, and there are no guarantees of support for obsolete releases. If you liked Red Hat Linux, Fedora Core offers a Red Hat-like Linux to work and play with, and Red Hat gets a place to experiment with new stuff before releasing it to enterprise customers.

Both versions are still Linux, and both consist of open-source code that Red Hat is legally bound to disclose to users. But the raw source code still has to be compiled and installed as binary code, and that's what's on those CDs you get as part of your enterprise subscription, so Red Hat doesn't offer free downloads of those.

If you *really* wanted an enterprise-quality OS like RHEL but couldn't afford the subscription, you actually could do it and Red Hat can't stop you. Just download the source code packages from Red Hat, yank out anything proprietary or commercial (including references to Red Hat), compile them all, and presto—you have a Linux that's functionally identical to RHEL. All you've spent is your time.

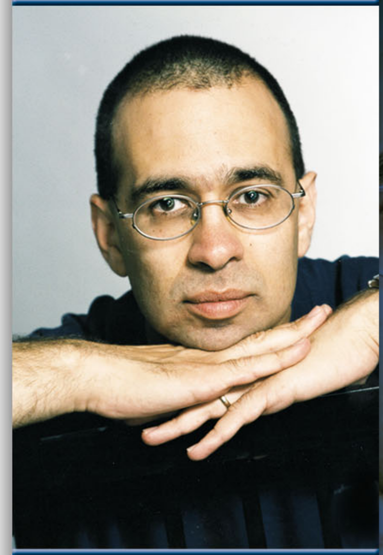
Not sure if you're up to that hassle? Don't worry. A group of developers is already doing it for you. CentOS (The Community ENTerprise Operating System; centos.org) is, ". . . an Enterprise-class Linux Distribution derived from sources freely provided to the public by a prominent North American Enterprise Linux vendor." That prominent vendor is Red Hat, but CentOS isn't specific to avoid legal problems. Even so, "CentOS conforms fully with the upstream vendor's redistribution policy and aims to be 100% binary compatible. (CentOS mainly changes packages to remove upstream vendor branding and artwork.) CentOS is free."

CentOS is hardly the first distribution to "rebuild" Red Hat's OSes; current rebuilders include Scientific Linux (www.scientificlinux.org), White Box Linux (whiteboxlinux.org), and X/OS Linux (www.xoslinux.org). CentOS stands out, having developed a respectable installed base, forming a committed community of professionals who want an enterprise-quality OS but don't need the support that's such an important part of the value that Red Hat adds to its offering.

And, surprising to some, Red Hat doesn't mind. It understands that free RHEL-based distros are a good thing. If you don't want to pay for RHEL, you can get a different Linux elsewhere free; it's better for Red Hat if "freeloaders" use a RHEL-compatible Linux because it builds the RHEL community. More to the point, the rebuilders provide a ready-made population of companies that use RHEL-clones, for now, but who may eventually upgrade to full Red Hat support.

It's smart to encourage everyone who admires your work. Someday those nonpaying admirers just might become profitable. ▲

You can get saucy with Pete at pete@cpumag.com.



Pete Loshin, former technical editor of software reviews for Byte Magazine *(print version), consults and writes about computing and the Internet. He also runs www.linuxcookbook.com. He owns shares of both Microsoft and Red Hat and believes that Windows isn't for everyone, but neither is Linux.*

It's smart to encourage everyone who admires your work. Someday those non-paying admirers just might become profitable.

When The Wiki Hits The Fan

Can Truth Be Open Source?

Since its launch in 2001, things seemed to be going along swimmingly for Wikipedia. By letting anyone add and edit entries to the massive and quickly growing compendium of knowledge, Wikipedia has achieved growing respect and usages online. Many online blogs and even newspaper stories now reference its entries. In early 2006 Wikipedia announced its 1 millionth article in the English edition (now 3.3 million across 125 languages). About the same time founder Jimmy "Jimbo" Wales got official recognition as one of *Time* magazine's "The *Time* 100" figures now shaping our world. In fact, *Time* labeled Wikipedia, "the biggest (and perhaps best) encyclopedia in the world."

Open-Source Reference Weaknesses

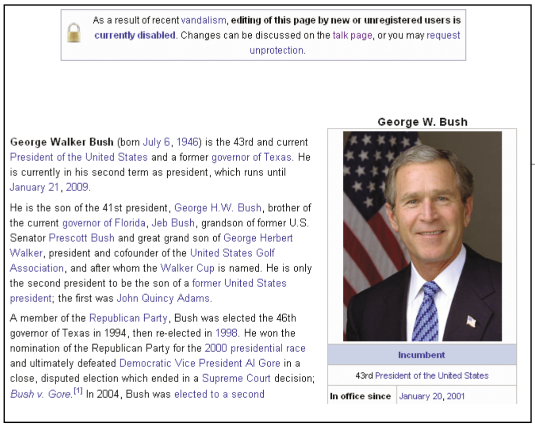
That, of course, depends upon whom you ask. "Wikipedia can be a forum for publishing biased, prejudiced, and salacious material, as well as disinformation and propaganda of all stripes," says Theodore Pappas, executive editor, Encyclopedia Britannica. In its attempt to apply an open-source approach to information, Pappas believes Wikipedia "commits fundamental publishing vices of the most serious kind." There's rampant vandalism of entries, he notes, along with the site's resolute reliance on nonexperts to craft and monitor entries. How credible can any item be in a reference work if it's only as accurate as the last edits from the most recent anonymous visitor?

In large measure Pappas is right. Anyone can revise an entry in Wikipedia at any time, and Wales himself acknowledges the inherent weaknesses of an open-source reference. The antidote, he argues, is transparency. The user can see when articles are in dispute and even compare differences among previous versions or link to a specific iteration the reader deems most reliable. Wikipedia doesn't reveal the specific personal identities of posters, but Wales claims that the nonprofit WikiMedia Foundation does block known vandals via their IP addresses. And, after all, if Wikipedia weren't serious about transparency and impartiality, would it include lengthy entries on "Criticism of Wikipedia" that actually outline the common complaints? "Obviously there is something quite radical and new about the method," says Wales. "But it only works because we are so fixated on quality. If we didn't have the social norms in the community, then yeah, you could have a Wiki site that ended up being basically anyone writing anything. If someone puts nonsense on [Wikipedia] it gets reverted quickly."

Not always, says retired journalist John Seigenthaler and founder of the First Amendment Center. For 132 days an erroneous and malicious biography of Siegenthaler remained unchecked and unchanged on Wikipedia. The entry about this former staffer to Robert Kennedy hinted vaguely at Seigenthaler's possible connection to the assassination of both Kennedy brothers. Worse, other reference sites that now routinely use Wikipedia information copied the entry. It took months for Seigenthaler to get Wikipedia to correct the material.

Safeguards

Wikipedia insists that, although there are instances of vandalism and people trying to game the open-source system, many social safeguards and policies minimize these problems across most of the site's 1 million English-language entries. Users can keep a watch on any entry, and Wikipedia will notify them when someone makes a new edit. Editors can request negotiation over an entry by petitioning the Mediation Committee. If mediated negotiation among editors doesn't resolve the conflict



As a result of recent vandalism, **editing of this page by new or unregistered users is currently disabled**. Changes can be discussed on the talk page, or you may request unprotection.

George W. Bush

George Walker Bush (born July 6, 1946) is the 43rd and current President of the United States and a former governor of Texas. He is currently in his second term as president, which runs until January 21, 2009.

He is the son of the 41st president, George H.W. Bush, brother of the current governor of Florida, Jeb Bush, grandson of former U.S. Senator Prescott Bush and great grand son of George Herbert Walker, president and cofounder of the United States Golf Association, and after whom the Walker Cup is named. He is only the second president to be the son of a former United States president; the first was John Quincy Adams.

A member of the Republican Party, Bush was elected the 46th governor of Texas in 1994, then re-elected in 1998. He won the nomination of the Republican Party for the 2000 presidential race and ultimately defeated Democratic Vice President Al Gore in a close, disputed election which ended in a Supreme Court decision; *Bush v. Gore*.[1] In 2004, Bush was elected to a second

Incumbent

43rd President of the United States

In office since January 20, 2001

Controversial public figures often attract so many edits and attempts at vandalism at Wikipedia that the administrators have to lock down a version from further changes and let users discuss further changes in Wikipedia's Talk sections.

over an entry, the disagreement gets kicked up to an Arbitration Committee, which upon direction from the Wikipedia Board can make a final judgment.

Wales says that there are also several safeguards among the administrators who form the core of active contributors, so that no one of them gets to lock down an entry from further edits, especially anything he or she helped write. It's all about consensus. Wales follows a core faith that despite individual instances of abuse, the open-source approach to information gathering results in greater accuracy and editorial quality over time.

Perhaps inevitably Wikipedia has spawned a growing coterie of detractors and disillusioned refugees from the flock. Former editors recently created Wikitruth.info, which purports to expose articles and edits that Wikipedia censors and other "atrocities" involving in-fighting among the administrators. And there's the Wikiwatch blog (users.erols.com/mwhite28/wikiwoo.htm) that tracks criticism about Wikipedia and the hoax entries on the reference site.

Amateurpedia

At issue for journalists and reference workers is how readers of a collaborative Wiki project can trust the facts in any given article at any given time. "In a Wiki environment people are checking various sources, but there is inconsistency between one article to the next," says Greg Swayne, president of HowStuffWorks. One of the problems with an open-source approach is clarity itself, he says, along with sheer reliability. Reference resources such as HSW distinguish themselves with intense editing, where field experts and trained writers explain highly technical information so that it's fully understandable to readers.

Swayne doesn't dismiss the Wiki movement by any means and is developing ways of incorporating user-generated feedback and information into HSW. Nevertheless, fact checking and sourcing are longstanding regimens in publishing that collaboration, even among committed amateurs, can't match. "Sourcing behind every article for journalists is a well-respected part of how they create original pieces of content," he says. "We have very specific rules that we follow that require all content to be sourced from multiple sites, and all of that is checked and rechecked. We have rules that say you cannot electronically copy any text from any source. There a number of things we do routinely to make sure content has integrity as well as accuracy."

What distinguishes a formal reference work from Wikipedia, say many publishers, is the reliability of the information across the board and in every instance because the readers of any given entry aren't always

Jimmy "Jimbo" Wales: Fact Checking The Wiki Way

Jimmy "Jimbo" Wales is the co-founder of Wikipedia. He says that a tight community of editors at the heart of this organization keeps the editorial quality improving. People often mistake Wikipedia's open-source method of gathering information for some kind of anarchy—where any amateurs become authorities and all facts are matters of opinion. But expertise, accountability, and impartiality are all guiding principles here, Wales says.

CPU: Can you explain the workflow of an entry and how you maintain accuracy along the way?

Wales: We use what we call an accountability model. We mean that all the work that everyone does on the site is traceable back to them or their user ID, so we can see who is doing good work and who isn't. There are a lot of tools in the software that enable the volunteers to monitor and rack quality of the articles. The result is, on average, the articles tend to be of very high quality across the board.

CPU: But how does this approach compare to traditional fact checking?

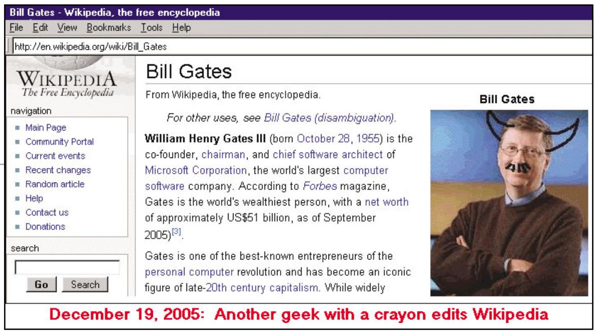
Wales: One of the important things to know about Wikipedia is that we are very old-fashioned and conservative about these kinds of issues. As a community we're really driven by certain principles of verifiability, no original research, neutrality. Our approach is the traditional process writ large. That's a little bit surprising to people: They assume that because of the open-editing process that we think anyone's opinion is as good as anyone else's. But that is not true at all.

CPU: What would you identify as the biggest hole in the Wikipedia system right now?

Wales: The main thing is the difficulty as we grow of maintaining friendly relationships within the community. There is this view out there that there are a billion people adding one or two pieces [to Wikipedia]. That is false. There is a core group of friends who monitor everything, talk to each other, discussion, dialogue, negotiation, compromise. That gets harder to do the larger we get. ▲

(For more on Jimmy Wales, see our "Technically Speaking" interview on page 98 of the July 2005 issue of *CPU*.)

Several online groups now track hoaxes and vandalism at Wikipedia: an example of a vandalized entry.



Bill Gates - Wikipedia, the free encyclopedia

http://en.wikipedia.org/wiki/Bill_Gates

Bill Gates

From Wikipedia, the free encyclopedia.

For other uses, see Bill Gates (disambiguation).

William Henry Gates III (born October 28, 1955) is the co-founder, chairman, and chief software architect of Microsoft Corporation, the world's largest computer software company. According to *Forbes* magazine, Gates is the world's wealthiest person, with a net worth of approximately US$51 billion, as of September 2005)[3].

Gates is one of the best-known entrepreneurs of the personal computer revolution and has become an iconic figure of late-20th century capitalism. While widely

Bill Gates

December 19, 2005: Another geek with a crayon edits Wikipedia

knowledgeable enough to detect the subtler frauds. “The blatant vandalism that Wikipedia claims it can catch like profanity are the easy ones,” says Pappas. “The more telling things are the credible lies, the things interjected by propagandists. How difficult is it for administrators to catch these things?”

In contrast to an open-source collaboration among amateurs and volunteers, no matter how well-intentioned, Pappas says that a traditional rigorous approach to reference is also dependent on community, but of a very different sort. “Ours is composed of 4,000 experts, 110 Nobel Prize winners,” he says. Many Wikipedia entries are patchworks of multiple edits in diverse voices. Good reference isn’t just a matter of accuracy but communicability. “We find the best person in the world to write on the subject and know how to edit that piece so it has a form and structure that is conducive to good communication,” he says. “When theoretically a 12-year-old has the right to rewrite or edit the work of a Nobel Prize winner, most people wouldn’t find that a credible publishing model.”

Nature vs. Britannica

If Pappas seems to be fuming a bit over Wikipedia, that’s because a late 2005 article in *Nature* magazine compared Wikipedia favorably to Britannica. Expert reviewers compared similar entries on science topics between the two online sources. The reviewers located mostly minor errors in both, but at a rate of three per Britannica entry vs. four per Wikipedia entry.

And so the war was joined. Ironically, this, the biggest skirmish thus far in the argument over Wikipedia’s reliability, didn’t involve Wales at all. It became a scuffle over methodology involving two of the more respected reference brands in the world. Britannica responded to the *Nature* article with a 20-page response entitled, “Fatally Flawed.” The editors not only defended the accuracy of Britannica content but directly attacked *Nature*’s research methods, “The study was so poorly carried out and its findings so error-laden that it was completely without merit,” the response said. For its part *Nature* stood by the research and the story.

Reference & Journalism Fused?

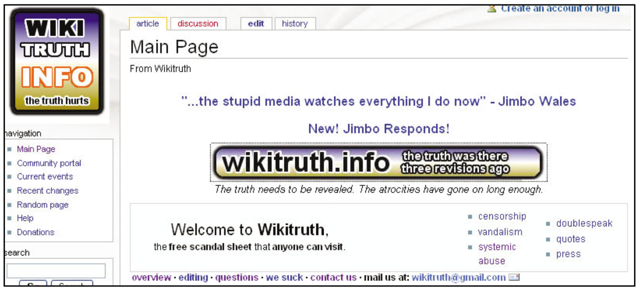
Debates about the Wiki approach to knowledge and publishing will only accelerate as user-generated media becomes more important to the Internet. Newspapers and magazines are already partnering with top bloggers. Almost all publishers, including Britannica and HowStuffWorks, are exploring ways of leveraging user opinion and expertise alongside their expert and expertly vetted editorial. Wales himself foresees the future of all media, journalism, and general reference pursuing “hybrid approaches.” “We’ll always need news reporters who go out and get the story professionally, but we’ll also see a huge impact from citizen participation,” says Wales.

And Wales isn’t shy about entering hot spots. The next big world for him to conquer is politics. Wales runs Wikia, which makes the MediaWiki software that runs many Wiki sites. Wales is interested in supplying Wiki software to political campaigns as a way of letting volunteers and staffers collaborate on planning as well as message creation and recruiting. Wales believes that the broadcast model of media fostered a politics that favored personal image and sound bites. “Actual participatory dialogue gets lost in that process,” he says. “With these [Wiki] tools we are going to see the re-emergence of participatory dialogue. With blogs, with wikis, eventually in campaigns it’s going to be a radically transformative thing.”

And no doubt just as controversial. CPU

by Steve Smith

Wikitruth.info has become one of the chief antagonists of Wikipedia. With tongue firmly in cheek, the prankish site pokes at hoaxes, vandalized entries, and statements from Jimmy Wales.



Main Page

From Wikitruth

"...the stupid media watches everything I do now" - Jimbo Wales

New! Jimbo Responds!

The truth needs to be revealed. The atrocities have gone on long enough.

Welcome to **Wikitruth**,

the **free scandal sheet** that **anyone can visit**.

overview · editing · questions · we suck · contact us · mail us at: wikitruth@gmail.com

Infinite Loop

Learning To Hear From A Fly

According to Janine Benyus, Biomimicry is the science of observing nature to find solutions to human problems. Biomimicry.net is your guide to the wonders of nature and what they can do to help us overcome our limitations. For instance, the study of Ormia fly’s super-sensitive hearing has led researchers to develop better hearing aids. Click the Case Studies link to see how chimpanzees are helping us find healing plants and hibernating bears are teaching us ways to fight diabetes.

Source: www.biomimicry.net/intro.html

The Department Of Stuff

eyecandy.txt

by Rob “CmdrTaco” Malda

I’ll be honest, I love eye candy. In the early days of the Linux desktop, I spent a large amount of free time hacking open-source code related to desktop eye candy. From window managers to button bars to fancy animations and general graphical excess, I loved the stuff. I still do. If an option is available for eye candy, I always turn it on—if only for a little while.

For open-source developers, eye candy is always optional. It is often tucked away from users and rarely “on” by default. Sometimes it is hidden away in compile time options. Other times it’s a few checkboxes in a UI. But open-source software generally errs in the way of too many options and a preference toward older hardware, so we’re fine.

For the commercial OS users it’s not so nice. Fancy things such as animating window minimization, translucency, and even fancy, animated screen savers are becoming more a part of the desktops the world takes for granted every day. And this glitz is simply another piece of a puzzle expanding ever outward. This also guarantees that your grandma needs to buy a computer every few years just to do the same old things.

I could make a case that these things are wasteful; much of this stuff is quite simply “bloat.” So often these little animations add clock cycles to a simple task or suck up RAM for something that ought to have sparse requirements. And don’t get me started on disk space. The first GUI word processors fit on a floppy disk. Why do I need a DVD to install them and a gig of RAM for them not to hit swap space?

But it’s not just that. With each generation of computing muscle, we add new hardware to satiate our hunger: faster video cards, bigger hard drives, and more RAM. We get the latest CPU with more gigahertz than you would have thought possible a decade ago.

Back in the day it was simple: You had a pull-down menu and maybe a button bar. Soon came two or three bars and then eventually there were bars on the sides, the bottom, and elaborate UIs for maintaining all of your button bars. Before the trends ended, you had little more than a portal for your actual data to sit in the middle of your screen.

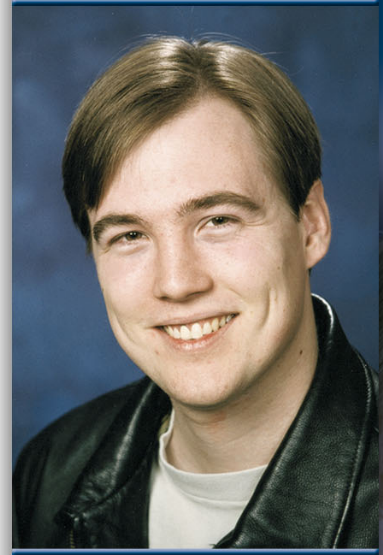
Resolution has increased, and thank God most applications have backed off forcing users to memorize what dozens of tiny illegible icons mean. I think we largely owe the Web for that. That ubiquitous, underlined blue text really shifted the way even desktop apps were and are designed.

However, you’ve got icons bouncing, IM windows popping onto the edge of your screen, and animated characters popping out to tell you some triviality. And everything is animated, antialiased, transparentized, spinning, and drawing your eye toward it. It is almost as bad as a 24-hour news network. Do you know anyone who actually likes the way these networks barrage you with animation?

The issue is that many of these wacky animations are really useful. New users frequently don’t understand the connection between clicking some icon and the appearance of a window. Or minimizing a window and having it appear on your dock. Animating this stuff gives the user critical context.

But more than only giving Nvidia a reason to sell you a new video card every 18 months, I think we’re overlooking something else: Hacking off-the-wall graphics is plain fun. I get all nostalgic thinking about the silly, worthless animation and graphical bloat I coded for window managers in the ’90s. Almost none of it should be in a “real” operating system, but it was educational, fun, and sometimes jaw-dropping to see. Every now and then, shouldn’t your computer be able to do that, too? ▲

Contact me at malda@cpumag.com.



Rob "CmdrTaco" Malda is the creator and director of the popular News for Nerds Web site Slashdot.org. He spends his time fiddling with electronic gizmos, wandering the ’Net, watching anime, and trying to think of clever lies to put in his bio so that he seems cooler than he actually is.

> If an option is available for eye candy, I always turn it on —if only for a little while.

ROAD Warrior

by Jen Edwards

Technocutie Offers Hip Designs For Mobile Women

Looking for a cool techie gift for your special lady? Technocutie (www.technocutie.com) has a full line of new, handmade iPod cases, as well as accessory pouches and laptop purses made of felt with original embroidered designs. The iPod cases are made of retro vinyl and come in Red Rose Diner or Moonlight Diner (blue) colors. Both cases have clear vinyl inserts for the iPod's screen and Click Wheel, plus cutouts for the headphone jack, charge/sync port, and hold switch. Options are available for fourth- and fifth-generation full-sized iPods, as well as the nano. Prices start at $16, and custom-case design services are also available for additional fees. ▲

Sirius' new Sportster4 radio lets you take satellite radio with you in a much smaller form factor.

New Sportster4 Coming From Sirius

If you've been looking for a new radio to listen to Howard Stern with, you're in luck. Sirius Satellite Radio announced in mid-May plans to release a new Sportster4 radio that should be available as you read this. Sirius says the Sportster4 is 40% smaller than the company's previous Sportster Replay, measuring just 4.5 x 2.5 x 0.6 inches (HxWxD) and weighing just 4.2 ounces. Like the Replay, the Sportster4 is designed for easy transport and use at home, in the car, and at the office.

The new radio lets you pause, rewind, and replay up to 44 minutes of programming, and there's an included remote control, 30 program presets, favorite artist alerts, and game reminders for sports fans. Additionally, a new dock for automobiles that reportedly will include an auxiliary input for MP3 players should be available when the Sportster4 launches. Additional accessories, such as home stereo docks, should be available soon after launch. The Sportster4 is priced at about $170. ▲

The new, rugged OtterBox Laptop Case provides the ultimate protection for your delicate notebook.

New OtterBox Cases Safeguard Laptops

OtterBox (www.otterbox.com)—a well-known maker of waterproof, crushproof cases for such handheld devices as mobile phones and iPods—has applied its case design to notebooks in the form of the OtterBox Rugged Laptop Case. Depending on the size of your notebook's screen, cases are available in three sizes, including Small (up to 13-inch screens), Medium (15 inches), and Large (17 inches).

The cases include complete protection against dust, water, and accidental drops and are designed to let you use your notebook without having to remove it from the case. The cases also have an ergonomic carrying handle and security lock integrated in the top, plus a shoulder strap with swivel mounts. Inside, the cases are lined with Velcro to make stowing a laptop and accessories easy, and you can also configure removable rubber "bumpers" to hold the laptop more securely. A quick-release strap makes removing the notebook from the case easy during airport security checks, and access ports in the case make plugging in DC power and USB peripherals convenient.

OtterBox's medium-sized laptop case should be available as you read this, with the small and large cases to follow by year's end. Pricing hadn't been finalized at press time, but the small case is expected to start at about $130, the medium case at about $150, and the large case at about $170. iPod owners may also be interested in the waterproof headphones OtterBox is selling for use with its iPod cases through a new partnership with H2O Audio. ▲

The Samsung X820 is the slimmest mobile phone in world, but will we ever see it here in the States?

Samsung Releases World's Thinnest Phone Yet

Samsung is claiming that its SGH-X820 is now the thinnest mobile phone available in the world. At just 0.27 inches thick, the SGH-X820 is as thin as the iPod nano, but amazingly the candybar-style phone still has a 2MP camera, video-capturing ability, MP3 music-playback capabilities, a document viewer, TV-out jack, Bluetooth networking, and 80MB of integrated memory. The phone's body is made of fiberglass-infused plastic to increase its durability while decreasing its weight (66 grams). The SGH-X820 is now available in Europe and Russia and is expected to launch in China this summer. There's no word yet when or if the phone will hit the United States, hopefully in a CDMA-based model. ▲

Toshiba Unveils First HD DVD Laptop At E3

Beyond making the Qosmio G35-AV650 the first laptop to ship in the United States with an HD DVD optical drive, Toshiba packed numerous other impressive high-end components into the relatively small notebook, including an analog TV tuner, Intel Core Duo T2500 2GHz processor, 17-inch WUXGA Ultimate TruBright widescreen display (1,920 x 1,200; HDMI output at 1080i), and a Nvidia GeForce G0 7600 video card with 256MB of memory.

The notebook has two SATA 100GB hard drives but a smallish 1GB of PC5300 DDR2 SDRAM. The G35-AV650 runs on Windows XP Media Center Edition, but you can bypass booting into Windows and get right to DVD watching with a push of a button. Other features include harmon/kardon's Bass Reflex technology and 1-bit digital amplifier, as well as the world's first laptop implementation of Dolby Home Theater with Dolby Virtual Speaker technology for headphone, 2.1-, or 5.1-channel surround sound listening. More traditional features include 802.11a/b/g WLAN and Bluetooth capabilities, an integrated 5-in-1 memory card reader, PC Card slot, FireWire, four USB ports, and Ethernet and modem ports.

The Qosmio's footprint is relatively large at 2.1 x 16 x 11.6 inches, and its weight is a relatively hefty 10.1 pounds, thanks in part to all the built-in functionality. The Qosmio is available from Toshiba starting at $2,999. ▲

Nintendo Sets U.S. Launch Date For DS Lite

Nintendo announced a June 11 release date for the U.S. launch of its DS Lite handheld gaming device at E3 in May. The DS Lite will reportedly sell for $129.99 from major retailers. Although there were three DS Lite color choices upon its Japanese launch earlier this year, units for the U.S. release will initially only be available in Polar White. Nintendo says the DS Lite is two-thirds the size of the original DS, 20% lighter, has brighter screens, and the Start and Select buttons have been repositioned for easier access. Nintendo also announced it has sold more than 16 million DS units since the worldwide launch in late 2004.

According to reports, Nintendo will add more than 100 games to the DS lineup before year's end. Games include such fan-favorite characters and series as Super Mario Bros., The Legend of Zelda: Phantom Hourglass, Donkey Kong, Kirby, Pokemon, Star Fox, WarioWare: Smooth Moves, and Yoshi's Island 2. A strong third-party lineup of original games also appears likely, including a version of the previously Sony PSP-exclusive Death Jr. franchise. ▲

New Compaq Business-Class Laptops

HP recently released five new Compaq-branded laptops that it is aiming at corporate professionals. The systems should also appeal to various other users, however. Included are the tc4400 (Tablet PC); nc6400 (wireless broadband capabilities); and nx7400, which weighs just 5.6 pounds but has a 15.4-inch screen and Intel Duo Core processor. The two other releases include the ultra-portable nc2400, which is less than an inch thin and weighs less than 3 pounds, and the nc8440, which has a 15-inch WXGA display and advanced ATI Mobility FireGL V5200 card.

All the new notebooks include at least 512MB of RAM and a 40GB hard drive. Available extras include a fingerprint scanner and a LightScribe dual-layer DVD burner. Prices start at $749 for the 5.6-pound nx7400 at the low end and go up to a starting price of $1,649 for the nc2400. ▲

At Your Leisure

The entertainment world, at least where it pertains to technology, morphs, twists, turns, and fires so fast it's hard to keep up. But that's exactly why we love it. For the lowdown on the latest and most interesting releases in PC entertainment, consoles, DVDs, CDs, and just leisure and lifestyle stuff we (for the most part) love and recommend, read on.

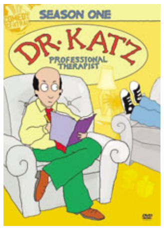
Audio Video Corner

DVDs by Chris Trumble,
CDs by Blaine A. Flamig

Munich

"Munich" is an Oscar-nominated film about a small, handpicked team of Israeli operatives tasked with killing 11 Palestinians who the Israeli government believed were responsible for the murder of Israeli athletes at the 1972 Olympics in Munich, Germany. Director Steven Spielberg raises a number of questions throughout the film that are especially relevant in the post-9/11 world, and although much of the film shows these events from the perspective of the Israeli protagonist (expertly played by Eric Bana), Spielberg takes time here and there to look at them through Palestinian eyes, as well.

$29.98
Universal Studios Home Entertainment
www.munichmovie.com



Dr. Katz, Professional Therapist: Season One

One of the best new TV shows back in '95 was a Comedy Central show called "Dr. Katz, Professional Therapist." Dr. Katz starred standup comic Jonathan Katz and featured guest appearances by numerous standup comics (Ray Romano, Dave Attell, Dom Irrera, and others) as Dr. Katz's patients. The show's laid-back, incidental brand of humor was just the right combination for its unique style of animation, known as Squiggle Vision, and Comedy Central went on to air six excellent seasons of the program altogether. The Season One DVD hit stores in May and is one of the best ways we can think of to spend $20.

$19.99
Paramount Home Video
www.comedycentral.com

The Raconteurs—"Broken Boy Soldiers"

When the talk turns to Jack White, you often hear rock journalists or fans ask, "What's the big deal anyway?" White (and his two-person band The White Stripes) are something you either get or don't. If you do, you love White's eclectic talents, but you know he's hit and miss. Where "Elephant" was brilliant fun, "Get Behind Me Satan" was too weird to care about. Still, when talk started turning to The Raconteurs awhile back, it was hard not to anticipate what White would do with his own rock band. So, what's the word on "Broken Boy Soldiers"? Unfortunately, hit and miss.

$12
V2 Records/Third Man
www.theraconteurs.com

Red Hot Chili Peppers—"Stadium Arcadium"

An unfortunate thing sometimes happens to bands as they age: They don't rock the way they did when you first started to like them. The upside is that as the band grows old together, like the Chilis have, they tend to get to be really good musicians. The Chilis whip out a few funk/thrash/punk/surfer rock numbers on the two-disc "Stadium Arcadium," but most tracks are midtempo burners that show off Flea and Chad Smith's rock-steady rhythm section and John Frusciante's mad, mad guitar chops. Ultimately, Frusciante owns "Stadium Arcadium," and it's worth paying for just to hear him shine.

$15
Warner Brothers Music
www.redhotchilipeppers.com

See the full reviews from A/V Corner at www.cpumag.com/cpujul06/AYL

DVD Byte

June 6

Butch Cassidy And The Sundance Kid: The Ultimate Collector's Edition

The Chris Rock Show: The Complete 1st & 2nd Seasons

Running Scared

Entourage: Seasons 1 & 2

June 13

16 Blocks

Beavis & Butt-head: The Mike Judge Collection Vol.2

The Boondocks: The Complete First Season

Cheers: Seasons 1-8

June 20

The Hills Have Eyes

Night Watch

Syriana

Superman: The Animated Series, Volumes 1-3

June 27

Failure To Launch

Nova: Great Robot Race

Ultraviolet

Monk: The Obsessive Compulsive Collection

GUILD WARS® FACTIONS™

A Diabolical Follow-Up

-by Dr. Malaprop

$49.99 (PC; $69.99 Collector's Edition) • ESRB: (T)een • NCsoft • www.guildwars.com

If you look back at our review of last year's Guild Wars (name updated to Guild Wars: Prophecies), you'll see that we enjoyed it mightily. Prophecies was an MMORGP that took us away from World Of Warcraft for an extended period of time and has us still playing. And unlike WoW, the only investment was the purchase price of the game without any pesky monthly fees. Factions is no different, and we can expect at least another full Guild Wars retail release by year's end.

You don't have to own the original game to play Factions, and gameplay is none the worse for that, which is in itself quite a feat. It wouldn't be surprising to see someone pick up Factions and then head back out to buy a copy of Prophecies to unlock the original content area (called Cantha). If you own both games and find your way to the port, you will be able to cross the seas between the lands.

Unlike MMORPGs, such as WoW and Everquest, which feature persistent worlds with "instances" placed within for specific player parties, Guild Wars plays more like Diablo. In other words, the persistent areas include environmental constants, such as towns and outposts, but a majority of the gameplay occurs in instances of those persistent areas that are specific to your group. Some may find this troublesome, but anyone that remembers how addictive Diablo was will understand and approve.

Improvements are obvious from the get-go to anyone that's spent any time with Prophecies. The character creation screen already looks better than the previous game. The original title was set in Tyria, but Factions drops you into the Asian-themed Cantha. Jump into Tyria and you'll immediately see that the instances seem more alive compared against the more barren-feeling instanced areas you'll find in Prophecies. Get going, and you'll be hard pressed to stop, which is the hallmark of the best games.

The campaign's key missions (there are 15 of them) are all well-designed and will walk you through the story. They'll also teach you everything you need to know about the game to better prepare you for the PvP (Player vs. Player) combat. You can create a top-notch PvP character from the beginning and head into combat, which offers plenty of fun. But you'd be missing out on creating a character from scratch through the campaign, which has top-notch gameplay to offer. Experienced players may wish to try on one of the two new professions: Assassin or Ritualist. Both are fun to play, but the Ritualist is a much more demanding profession from the player perspective.

Graphically, Guild Wars looks substantially better than the stylized World Of Warcraft (which is showing its age). It's stunning to view and enjoyable to play. You may not spend as much time leveling in Guild Wars, but you'll exponentially boost your enjoyment by joining a good guild. (Sure, you can take NPCs on quests, but they're really just pretty dumb.) Factions is the real deal, and no serious gamer should go without trying either Prophecies or Factions. ▲

RISE OF NATIONS
RISE OF LEGENDS

All That & More *-by Dr. Malaprop*

$49.99 (PC) • ESRB: (T)een • Microsoft • www.riseoflegends.com

Rise Of Legends, sequel to the well-received Rise Of Nations, finally makes its way to store shelves. Brian Reynolds and his team at Big Huge Games have mostly succeeded with the release of this complex RTS follow-up. As before, the heavy but seamless use of economics powers much of the gameplay you'll experience. It's all brought together with an interface that is apt and never suffocating.

The historical basis of the original game transitions to a sci-fi fantasy-steampunk universe for RoL. There are three distinct races (Vinci, Alin, and Cuotl), and their differences become more obvious as the campaign rolls on. The sprawling campaign storyline tends to wander all over the map (pardon the pun), but it's intriguing because of its depth and uniqueness. The game is broken down among the races, and you'll play through each race in a manner similar to Blizzard's Starcraft, which is a compliment in more ways than one.

Playing RoL for a few hours will highlight many of its improvements. There's plenty here for RTS lovers—most of all superb gameplay, tons of units, interesting unit relationships/possibilities, unique (but attractive) artwork, and plenty of depth. In a time when games seem to clone each other, it's refreshing to come upon one that doesn't—and does so with aplomb. ▲

THE OFFICIAL GAME

Fun, But Not Quite A Legend

-by Chris Trumble

$59.99 (X360); $39.99 (Xbox, PS2, NGC); $29.99 (PC)
ESRB: (T)een • Activision • www.x-mengame.com

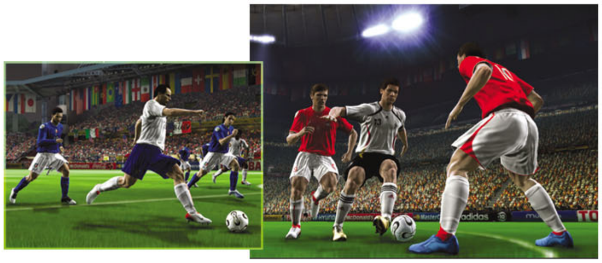
Activision and developer Raven Software scored a huge hit with their X-Men Legends games in 2004 and 2005; the action-RPGs let players use lots of characters, provided plenty of engaging action, and incorporated a cool character progression system that allowed for lots of customization. So when we heard Activision had another X-Men game in the works (this time from Z-Axis Games), we were understandably optimistic.

The Official Game is an action game tie-in for "X-Men: The Last Stand," which hit theaters a couple weeks after the game's launch. In it, you play as Wolverine, Nightcrawler, and Iceman, as they work to retrieve parts for Cerebro that were stolen during a raid of the Professor's compound and taken to the facility at Alkali Lake. Of course, the story takes a turn or two and soon heads in a slightly different direction.

Activision gets high marks for presentation; TOG's in-game graphics are nice and we quite like the comic book panel-like scenes between missions that advance the story. In addition, the main characters are voiced by the actors who play them in the film, including Patrick Stewart as the Professor and Hugh Jackman as Wolverine. The trouble, particularly for console owners, comes in the form of a few nagging gameplay issues. For example, the context-sensitive action button (X on Xbox 360) is the same as the quick attack button, so at times when your character engages enemies near control panels or other useable items, he isn't sure whether to attack or use the item, and much cursing ensues.

TOG is a good rental, and X-Men fans will dig it. But it lacks the polish and depth of the Legends games, which are still the best video games to date based on the world of the X-Men. ▲

2006 FIFA WORLD CUP

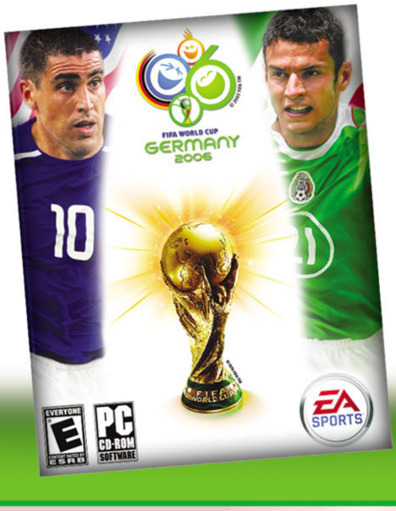


A Rush To The Finals *-by Dr. Malaprop*

$59.95 (360); $29.95 (PC, NGC, PS2, Xbox) • ESRB: (E)veryone

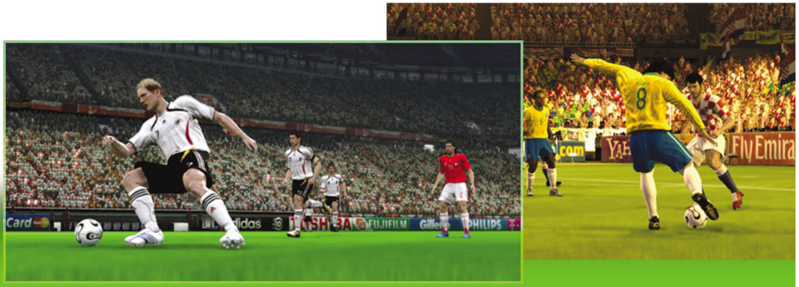
Electronic Arts • www.easports2006fifaworldcup.com

The 2006 FIFA World Cup (the IRL event, in case there's any confusion) will already have kicked off in Germany as you read this, with the finals in Berlin this month. EA Canada takes last year's impressively awful FIFA 06: Road To The World Cup and makes a stronger run for the goal. And on the Xbox 360, at least, the game actually *looks* better and features superb detail—down to players' emotions. Each of the platforms perform and play very similarly, but the 360 release looks the best (yes, even vs. the PC version) when you play it on a high-def big-screen.



We're happy to see the control scheme that was newly introduced in the previous iteration, but the subjective tactile feelings of ball contact and player movement still feel a wee bit off in gameplay, especially when you compare it to Konami's Winning Eleven games. This time around, though, you'll have game modes galore. The game includes all 32 teams playing this summer, but EA was thoughtful enough to include the remaining 95 teams that didn't make it. You can also unlock classic players and insert them into present-day teams, but unfortunately that doesn't extend to full historical national team rosters.

At the end of the day, though, 2006 FIFA World Cup feels rushed and falls well short of last year's FIFA 2006, which we praised heartily for its solid gameplay. Our console recommendation is Winning Eleven on Xbox or PS2. (Even EA is making changes in soccer gameplay that borrow from Winning Eleven.) That said, this release is your only choice for an attractive footie experience on the 360. It's enjoyable and looks excellent, but it's far less than what it should and could have been, especially on Xbox Live. We're holding out for the inevitable follow-up. ▲



ACE COMBAT ZERO
THE BELKAN WAR

Chocks Away, Baby *- by Chris Trumble*

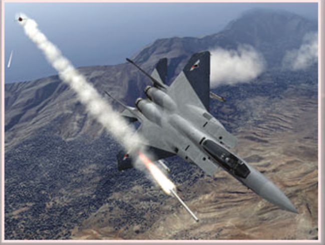
$39.99 (PS2) • ESRB: (T)een • Namco Bandai Games • Acecombatzero.namco.com

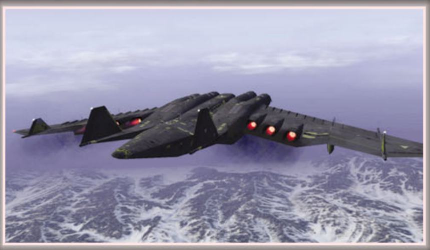
There has been a flurry of flight games released for current-gen consoles lately (or is current-gen really last-gen now and next-gen is current-gen?), including some set in the modern era and several with a WWII theme. They have varying degrees of realism vs. their arcade elements, but none of them does as good a job of balancing these factors as Namco Bandai's Ace Combat series.

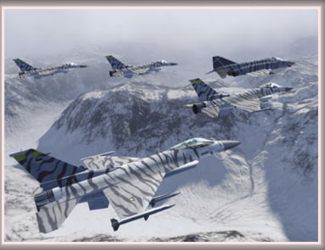
The newest member of the Ace Combat family, Ace Combat Zero: The Belkan War, is as its name suggests a step back in the series chronologically, and takes place 15 years prior to Ace Combat 5. The story that runs through the game is pretty standard fare for the Ace Combat series, but fans of the games know that the gameplay and, perhaps to a lesser extent, graphics that are some of the best among PS2 titles, are what really drives these games.

Namco Bandai ratchets things up a notch or two in Zero, adding AI that adjusts difficulty level, story elements (to some extent), and even radio chatter based on your flying skills and success. The game also expands a bit on the wingman command system Namco put in place in Ace Combat 5, giving you more options in coordinating their efforts with yours.

Those things aside, Ace Combat Zero serves up much more of the satisfying air combat we've come to expect from the series, including dogfights, attacks on ground and sea targets, and some escort missions. The planes look fantastic as always, the controls are solid and easy to pick up, and the audio is pretty good. We would like to see Namco add Internet play to the mix, but maybe that will come when the series moves to the PS3. (Ahem!) ▲



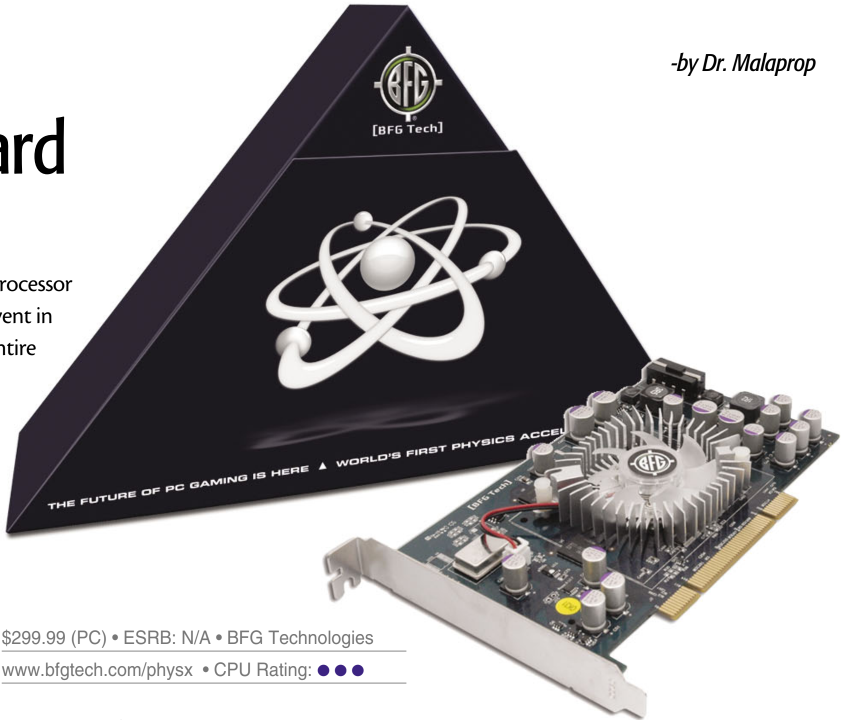




-by Dr. Malaprop

BFG 128MB Physics Card

PPU, Meet GPU/VPU & CPU


BFG
[BFG Tech]
THE FUTURE OF PC GAMING IS HERE ▲ WORLD'S FIRST PHYSICS ACCEL

$299.99 (PC) • ESRB: N/A • BFG Technologies

www.bfgtech.com/physx • CPU Rating: ●●●

The release of Ageia's PhysX technology and the PPU (Physics Processor Unit) on which it runs is undoubtedly the most anticipated event in PC graphics in a long while. In theory, the PPU aims to make the entire virtual world come alive and behave more like the real world in ways that modern GPUs simply can't on their own. Every object and event is bound by physical rules. Things move, break, fly, and collide in certain ways based on the physics programmed into them. If you want to swing a door into an enemy's face, you should be able to do that, and the results should be convincing. That's the goal Ageia is working toward.

Today's first-gen results are more humble. The BFG Physics Card uses 128MB of memory rather than 256MB and a PCI interface rather than PCI Express. Both of these factors may have contributed to the substantial frame rate hiccups we observed during large explosions and other fast, complex events. The number one PhysX-compatible game available today is Ghost Recon: Advanced Warfighter, which, along with an ATI X1800 XT running at 1,280 x 1,024 with an AMD FX-55, is what we tested.

Discussing comparative benchmarks is of dubious worth because there's no direct competition to compare against, and rest assured that Ageia will update this early iteration fairly soon. For now, let's just talk about the PhysX experience.

Today the PPU is interesting but not overly persuasive. In a nutshell, PhysX gives you more sparks and flying chunks. Explosions look a little more detailed, but you see this more with on-screen grabs than during gameplay. Without the PPU you might see half a dozen big chunks fly from an exploding car. With the PPU you get more chunks, giving the explosion a bit more realism. But the problem is that the pieces still look like blocky sprite blobs, not whizzing shrapnel, and they still vanish after sitting on the ground for a couple of seconds. When you blow a hole in a stone wall above you, the sizable debris raining down should hit and hurt you. That's real. But it doesn't do that. You see a little more detail, but you don't feel it because the physics at work is only illusory; it can't touch you. Yet.

We also got to take the Cell Factor demo for a spin, and the difference between that and GRAW is breathtaking. The liquid visual effects, something akin to the pressure waves you saw coming off of bullets in "The Matrix," are sweet, but the ability to blow up a pile of debris, see each piece spinning through the air, and then settle on the ground without vanishing is spectacular. The fabric blowing and tattering in the wind was quite realistic, too; although, even the demo showed off the PPU's propensity for bottoming out frame rates during difficult scenes.

Bottom line: The PhysX card is not worth $300 for the kind of improvements we saw in GRAW. If future titles (there are about 20 expected this year) deliver on the promise we saw in the Cell Factor demo and Ageia can improve those occasional frame rate potholes, then $300 starts to make a lot more sense. Of course, just when Ageia gets its footing, the Nvidia/Havok partnership may bear fruit. Deep breath, everyone. ▲

Xbox 360 Quick Charge Kit

Better Late Than Later

$29.99 (360) • ESRB: N/A • Microsoft

www.xbox.com/en-US/hardware/x/xbox360quickchargekit • CPU Rating: ●●●●●

The new Xbox Quick Charge Kit should have been available with the console's hardware launch this past winter. That's the only complaint we can level against this simple but very effective must-have accessory for anyone playing with the 360 wireless controllers. We would have invested in this up front rather than the Play 'N Charge Kit, but it's time to turn our thoughts to the future rather than the past.

The cost of the Quick Charge Kit includes the pictured charger, NiMH rechargeable battery, and AC adapter. The charger can hold up to two batteries simultaneously and takes two hours to charge a single battery and four hours for two. Plug in your empty charger, and a red light comes on to show that a charge is in process. Once fully charged, the light turns green, and the Quick Charge Kit stops sending juice to the battery packs.

After extended use, you'll eventually have to replace your NiMH batteries, but the Xbox 360 Quick Charge Kit is an effective way to save money on batteries and do your good deed for the environment. And, of course, you'll never, ever be lacking for power when you need it most. This is a must-have accessory for anyone using a wireless controller. It's simple and does exactly what it should. ▲

What's Everyone Talking About?

ComputerPowerUser.com

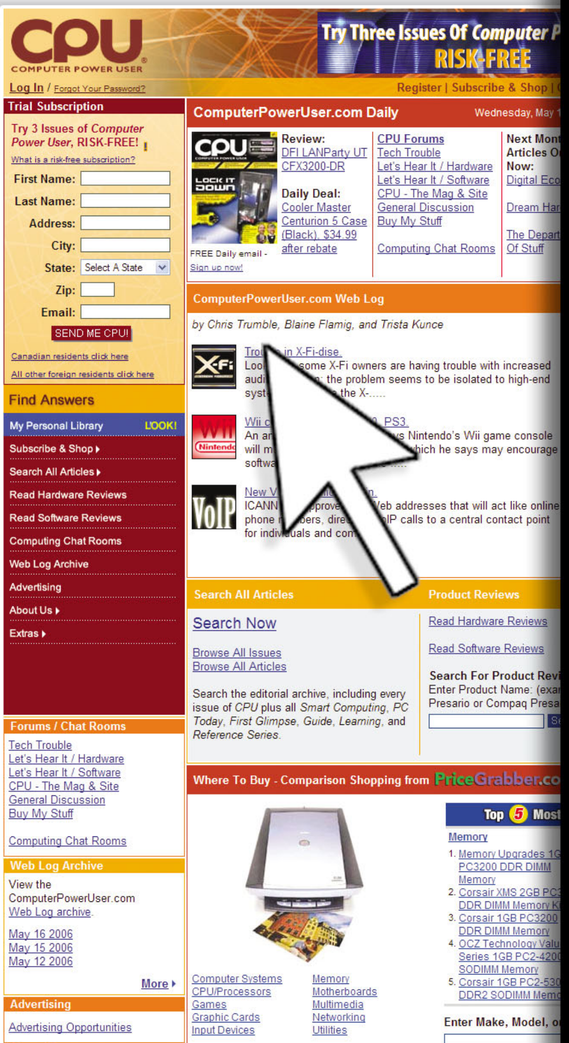
Take Advantage Of All The Extra Benefits Of Being A Paid Subscriber Today!

Here's what's available to everyone:

- The CPU Web Log. Each weekday, our editors scour the Web to bring you the best high-tech (and occasionally offbeat) information in an entertaining way.
- Forums to share (or show off) your thoughts and expertise. Great whether you know it all or want to know more.

Subscriber Tip Of The Month

Search All Articles. With over 25,000 articles in our extensive article library, we give you a variety of ways to narrow searches and find what you're looking for quickly. From the home page, click the Search Now link in the Search All Articles section. From this page, you can either browse articles, browse issues, or create your own 3-step detailed search. Find the answers you need today!


CPU
COMPUTER POWER USER
Try Three Issues Of Computer P
RISK-FREE
Log In / Forgot Your Password?
Register | Subscribe & Shop |

Trial Subscription

Try 3 Issues of *Computer Power User*, RISK-FREE!

What is a risk-free subscription?

First Name:
Last Name:
Address:
City:
State: Select A State
Zip:
Email:

SEND ME CPU!

Canadian residents click here

All other foreign residents click here

Find Answers

My Personal Library LOOK!
Subscribe & Shop
Search All Articles
Read Hardware Reviews
Read Software Reviews
Computing Chat Rooms
Web Log Archive
Advertising
About Us
Extras

Forums / Chat Rooms

Tech Trouble
Let's Hear It / Hardware
Let's Hear It / Software
CPU - The Mag & Site
General Discussion
Buy My Stuff

Computing Chat Rooms

Web Log Archive

View the ComputerPowerUser.com Web Log archive.

May 16 2006
May 15 2006
May 12 2006

More

Advertising

Advertising Opportunities

ComputerPowerUser.com Daily Wednesday, May 1

FREE Daily email - Sign up now!

Review: DFI LANParty UT CFX3200-DR

Daily Deal: Cooler Master Centurion 5 Case (Black), $34.99 after rebate

CPU Forums
Tech Trouble
Let's Hear It / Hardware
Let's Hear It / Software
CPU - The Mag & Site
General Discussion
Buy My Stuff

Computing Chat Rooms

Next Mont Articles O Now:
Digital Eco
Dream Har
The Depart Of Stuff

ComputerPowerUser.com Web Log

by Chris Trumble, Blaine Flamig, and Trista Kunce

Trou in X-Fi-dise.
Loo some X-Fi owners are having trouble with increased audi : the problem seems to be isolated to high-end syst the X-.....

Wii c 0, PS3.
An ar s Nintendo's Wii game console will m hich he says may encourage softwa

New V n.
ICANN pprove Veb addresses that will act like online phone n bers, dire IP calls to a central contact point for indiv uals and com

Search All Articles

Search Now

Browse All Issues
Browse All Articles

Search the editorial archive, including every issue of *CPU* plus all *Smart Computing*, *PC Today*, *First Glimpse*, *Guide*, *Learning*, and *Reference Series*.

Product Reviews

Read Hardware Reviews

Read Software Reviews

Search For Product Revi

Enter Product Name: (exa Presario or Compaq Presa

Where To Buy - Comparison Shopping from PriceGrabber.co

Computer Systems
CPU/Processors
Games
Graphic Cards
Input Devices

Memory
Motherboards
Multimedia
Networking
Utilities

Top 5 Most

Memory
1. Memory Upgrades 1G PC3200 DDR DIMM Memory
2. Corsair XMS 2GB PC DDR DIMM Memory K
3. Corsair 1GB PC3200 DDR DIMM Memory
4. OCZ Technology Valu Series 1GB PC2-420 SODIMM Memory
5. Corsair 1GB PC2-530 DDR2 SODIMM Mem

Enter Make, Model, o

Only paid subscribers to *CPU* magazine get complete access to all these great features:

Latest issues. Get a guided tour through the latest editions of our technology publications.

More hands-on hardware reviews. Are the latest products worthy of the marketing hype? We put products to the test, complete with comparison charts and links pointing to where you can buy the products online.

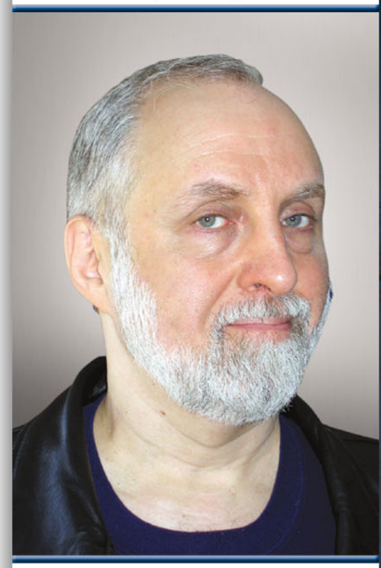
Even more great reading. Our Web site features every article from *CPU* and a searchable archive of more than 23,000 articles from our sister publications *Smart Computing*, *Learning Series*, *Guide Series*, and *Reference Series*. It's like getting five magazines for the price of one!

A showcase of articles from next month's issue. Impress your friends with all the insider information you get by reading *CPU*'s latest articles and product recommendations before they're available in print.

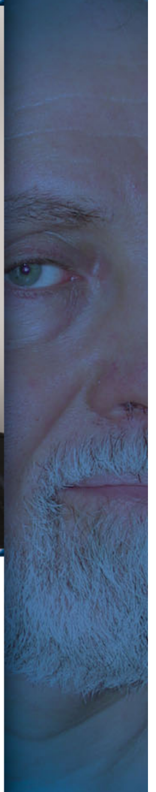
CPU
COMPUTER POWER USER

Guest Column
by Barry Brenesal

When Did The First Massively Multiplayer Online Environment Appear?



Barry Brenesal has written more than 1,000 published articles and reviews on electronic technology since 1987. His first personal computer was a Radio Shack TRS-80 model 100. It was last seen functioning as a boat anchor.



We're going to take the Wayback Machine this time to 1978 and visit Essex University. A student, Roy Trubshaw, wrote a game for the DEC-10 featuring a series of interconnected rooms or locations not unlike the general structure of the Colossal Cave adventure game so beloved of college kids at the time. You moved through its text-based areas by typing directions, interacting with objects you could place in your inventory or manipulate through appropriate commands. Trubshaw's game had one important difference, however, because you could visit the same areas with other people present in real time.

The program was rewritten but soon outgrew the DEC-10's 50K of RAM and was released in its final form in 1980. This last version became the first popular MUD, or multiuser dimension/dungeon. Richard Bartle, who had been assisting Trubshaw, took over its development after the latter's graduation. Word of the game spread, and non-students began calling in to play.

Other developers appeared to continue the same kind of work as freeware. Many MMORPG platforms were created, such as LambaMOO (Multi-User Dimension Object Oriented), LPMud, AberMUD, ProtoMUCK (Multi-User Character Kingdom), PennMUSH (Multi-User Shared Hallucinogen), etc. Each in turn was used to build literally dozens or even hundreds of games with as many as 15,000 rooms or more—one I know of claims to have more than 8,000,000—complete with distinctive themes and activities. While quite a few feature generic pseudo-medieval backgrounds that owe more to Walt Disney than they do to history, some are educational forums; still others are based on television series (like Buffy MUD or Star Trek: Legacy) or books (Narnia MUCK). Purposes range from complex role-playing environments to people who just enjoy building rooms and code, to folks who like to do nothing but sit around and chat. (Even in Latin; try dialing into Labyrinthus Latinus.)

1987 was another very important year, as it saw the beta test for the first graphical MMORPG, Habitat. Developed by LucasArts, it was closed in 1988 and immediately followed by Club Caribe. These were very simple affairs, from a user viewpoint, and mostly involved talking to NPCs, chatting, and exchanging goods. Daglow and Mataga's Neverwinter Nights, which ran live on AOL from 1991 through 1997, is considered the first true graphical MMORPG, with player-designed guilds, creatures to kill, and a number of periodic gaming events designed to breakup regular activities. It also involved a regular fee of $6 per hour and went head-to-head with sophisticated text-based MMORPGs on the same service provider.

I worked for one of those text-based MMORPGs in a minor capacity for roughly four years, churning out hundreds of rooms and items, roughly a dozen merchants, and many NPCs who reacted in a relatively intelligent fashion (at least when compared with some of the conduct you encounter in online forums these days). Through it all, one thing was clear to me: The never-to-be-equaled graphics of text-based materials. You can use a host of literary devices to ramp up a player's anticipation, color his mood, and engage his sympathies. We are trained by fiction to enter into the illusion given to us, and this works to the advantage of the text-based MMORPG.

Next to this, graphical MMORPGs lack the visual sophistication that can only originate in the greatest floor show of them all, the human imagination. All of which brings to mind a skit written more than 40 years ago by the radio personality and satirist, Stan Freberg, to show the superiority of radio over television. In it, we literally heard the construction of a 10-story tall hot fudge sundae in the middle of Lake Michigan, with Freberg reporting the event like a news piece every step of the way. (The sound of the 2-ton maraschino cherry being dropped by a B-52 was especially poignant.) And then, after a pause at its conclusion, Freberg capped it off by saying, "Let's see them do that on television."

Nowadays, all that written magic is put into gaming companies' public relations department to sell visual MMORPG clones. Think I'm getting crotchety in my old age? You're entitled to your opinion; just keep it to yourself unless you want a taste of my titanium-headed cane. ▲

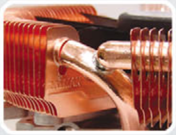
We are trained by fiction to enter into the illusion given to us, and this works to the advantage of the text-based MMORPG.

Wax nostalgic with Barry at Barry@cpumag.com

ULTRA QUIET DUAL HEATPIPE VGA COOLER

VF900

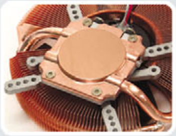
High Performance Dual-Heatpipes



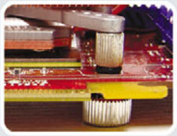
80mm Ultra Quiet Fan

0.2mm Pure Copper Fins

Flat Pure Copper Base



Easy Setup & Broad Compatibility



VGA RAM Heatsink

Stop relying on Economy class VGA Coolers,
Cool First class with the VF900!

Zalman's newest, high-performance VGA cooler utilizes twin heatpipes
to provide the best cooling performance for
the latest Geforce 7900 and Radeon X1900 XTX VGA cards.

Home Theatre PC Enclosure

HD160

HD160 provides optimal cooling with 100% aluminum body and air vents. The spacious interior accommodates many standard ATX motherboards, 4 HDDs, 1 ODD, and a 17-in-1 card reader.

Ultra Quiet CPU Cooler

CNPS9500 AT

CNPS9500 AT has an automatically controlled fan designed specifically to handle heat generated from LGA775 processors such as the Intel Dual Core Pentium D, Pentium 4, and Celeron D

Noiseless Switching Power Supply

ZM460B-APS

This product is an ultra-quiet ATX Ver2.03 / ATX12V Ver2.2 power supply that provides ample and stable power to the latest Dual-Core 64 bit Intel Pentium D & AMD Athlon64 X2 CPU-equipped systems.

Zalman Products Available at:

newegg.com www.newegg.com

TigerDirect.com www.tigerdirect.com

ZipZoomfly.com www.zipzoomfly.com

COMPUSA www.compusa.com

Fry's ELECTRONICS www.frys.com

MICRO CENTER online www.microcenter.com

ZALMAN

www.zalman.co.kr / www.zalmanusa.com

Software Tips & Projects

Slipstreaming With All The Fixins (Part 1)

Now that Windows Vista has been delayed into 2007, it's likely that many PC enthusiasts will need to reinstall Windows XP at least one more time before getting that new, clean Vista slate from which to work. As PC veterans know, the most efficient way to reinstall WinXP from an early-issue disc is via slipstreaming. This method integrates the original WinXP installation files with the newest SP2 updates so that you don't have to go through the added pain of downloading and installing SP2 after you reinstall Windows. Unfortunately, since SP2 launched, Microsoft has issued scores of additional hotfixes to the OS. So even after reinstalling WinXP via slipstreaming, you still have to use Windows' updater to download and install countless patches to get up-to-date. In this and the next tips column we revise and update our slipstream walkthrough to include SP2 and an easy way to integrate all of the subsequent patches into the reinstallation process.

For this project you will need:

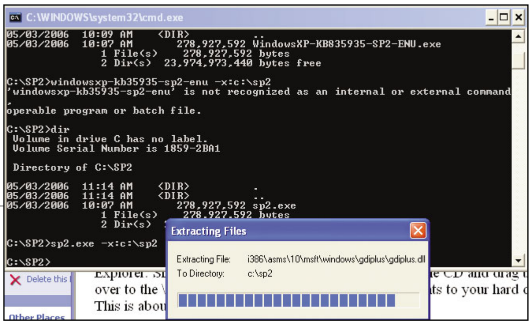
- Your original WinXP installation CD
- 2 to 3GB of free hard drive space
- A blank CD
- ISOBuster
- A CD burner program that can create bootable discs
- Two files from www.ryanvm.net/msfn: RVM Integrator (download and install) and RyanVM's Windows XP Post-SP2 Update Pack (download to a directory or leave on your Desktop)
- A couple of hours of time

Fair Warning: Back It All Up

Before doing a Windows reinstall, of course you should back up all critical data. Even if you're not reformatting your hard drive, a WinXP reinstall overwrites some of the key Documents And Settings subfolders that by default store many of your data and media files. For instance, a WinXP reinstall will wipe out your Outlook/Outlook Express data because those .PST files sit within the OS' file structure, which a new install overwrites. Use the internal tools to export your calendar, contacts, Inbox, and any other critical folders to a safe location or a disc. The same is true for any documents and media that Windows stores in default Documents And Settings file locations. Also, because a WinXP reinstall can destroy data, we choose to store all of our data files in custom directories that we created outside of the Documents And Settings folders. Nevertheless, any OS reinstall runs the risk of damaging the current root directory structure, so always back up everything you can't afford to lose.

Start Slipping

On your hard drive, create a new directory and name it something such as



```
05/03/2006  10:09 AM    <DIR>          ..
05/03/2006  10:07 AM       278,927,592 WindowsXP-KB835935-SP2-ENU.exe
               1 File(s)    278,927,592 bytes
               2 Dir(s)  23,974,973,440 bytes free

C:\SP2>windowsxp-kb35935-sp2-enu -x:c:\sp2
'windowsxp-kb35935-sp2-enu' is not recognized as an internal or external command
,
operable program or batch file.

C:\SP2>dir
 Volume in drive C has no label.
 Volume Serial Number is 1859-2BA1

 Directory of C:\SP2

05/03/2006  11:14 AM    <DIR>          .
05/03/2006  11:14 AM    <DIR>          ..
05/03/2006  10:07 AM       278,927,592 sp2.exe
               1 File(s)    278,927,592 bytes
               2 Dir(s)

C:\SP2>sp2.exe -x:c:\sp2

C:\SP2>
```

Extracting Files

Extracting File: i386\asms\10\msft\windows\gdiplus\gdiplus.dll

To Directory: c:\sp2

You can download a full 266MB version of SP2 and extract it to your hard drive.

WinXP Tip Of The Month

Windows XP Media Center Edition PCs are becoming much more common now that several OEMs make this version of the OS standard on many desktop and portable PCs. Like WinXP's PowerToys, MCE has its own collection of useful add-ins: Reuters For Media Center, a visual feed of fresh news info; loads of weather feeds; a My Movies add-on that indexes you flicks; an enhanced interactive TV guide from Titan TV; and scores more. You can find these gems at Windows Marketplace (www.windowsmarketplace.com/content.aspx?ctid=163).

Registry Tweak Of The Month

Sometimes it's easier to navigate a dense hard drive structure by opening a subfolder as the root directory of its own new window. You can add this option to the context menu by first clicking Start and Run, typing **regedit** in the Open field, and clicking OK. Next go to KEY_CLASSES_ROOT\FOLDER\SHELL key. Right-click the folder and select New and Key and name it rootexplore. Double-click Default in right-side window, type **Explore from here** in the Value Data field, and click OK. Create a new key off of rootexplore and name it command. Double-click the Default in the right-side window and type **Explorer.exe /e,/root,/idlist,%I** in the Value Data field. Now when you right-click a folder in Explorer, you'll see the Explore from here option, which opens a new window with this folder as its root.

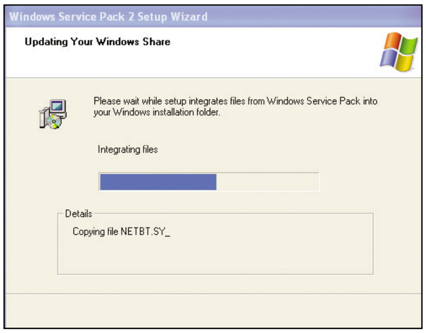
\xpcd. Insert your WinXP installation disc and open the drive folder with Explorer. Highlight all of the files and folders on the CD and drag them over to the \xpcd directory to copy the installation disc contents to your hard drive.

Next you need to retrieve the SP2 version for network installations. Go to www.microsoft.com/windowsxp/using/security/expert/russel_installsp2.mspx and scroll down to the How To Use The Network Install Version section of the page. Create a new folder labeled \SP2 and download the WindowsXP-KB835935-SP2-ENU.exe file here. For later ease of use, go back into that directory and rename the file sp2.exe. Now, to extract the SP2 files click Start and Run, type **cmd** in the Open field, and click OK. Type **cd\sp2** to move to the correct directory and then type **sp2.exe –x:c:\sp2**. It will take awhile to extract, but a pop-up box will eventually indicate completion.

Basic slipstreaming involves applying the SP2 update directly into the original WinXP installation files that you copied to the hard drive. In the command window you opened above, type **cd\sp2\i386\update** to go to the correct subdirectory. Type **update –s:c:\xpcd** to bring up a Windows Service Pack 2 Setup Wizard box that will show the integration process and acknowledge successful completion. Finally, close the command window.

Add The Fixins

The version of the WinXP installation files in your \xpcd directory are updated to SP2, and now you need to update this installation with all of the subsequent OS fixes Microsoft has issued in the past couple of years since SP2. There's a lengthy way to download every fix and manually integrate it into the WinXP installation files, but luckily, you downloaded RyanVM's Windows XP Post-SP2 Update Pack that includes all of the latest WinXP fixes and the RVM Integrator, which automates much of this process. In RVM Integrator, go to the Main tab and click the button to the right of the top field. Highlight the \xpcd directory and click OK to tell the program where to find your WinXP install files. Use the button beside the third field (labeled Choose An Update Pack CAB) and navigate to wherever you downloaded the file RVMUpdatePackXXX.cab and click Open to put that file in the right field. Click the Integrate button to start the lengthy process of weaving all the fixes into the WinXP installation files.


Windows Service Pack 2 Setup Wizard
Updating Your Windows Share
Details

Please wait while setup integrates files from Windows Service Pack into your Windows installation folder.

Integrating files

Copying file NETBT.SY_

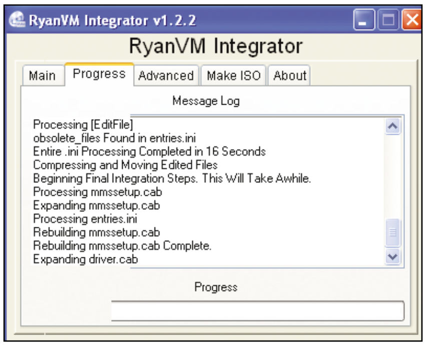
Having the full SP2 file lets you integrate this massive update into your original Windows XP installation files via slipstreaming.

(*NOTE: Be aware of what you download and put on to an installation disc. Browse to www.ryanvm.net/msfn/updatepack.html to see the files and tweaks the current package includes.*)

The Progress tab in RVM Integrator will show you when it successfully completes integration and then you can quit the program.

Get The Boot

In order to make your enhanced slipstream installation into a bootable CD, you need to grab a special file off the original WinXP install disc using ISOBuster. Load ISOBuster and direct it to the optical drive with your WinXP install disc. In the left navigation window, highlight the Bootable CD branch of the tree and look for the file Microsoft Corporation.img. Right-click the file and choose Extract Microsoft Corporation.img. The pop-up box will ask for a location; just extract the file to your Desktop.



```
Processing [EditFile]
obsolete_files Found in entries.ini
Entire .ini Processing Completed in 16 Seconds
Compressing and Moving Edited Files
Beginning Final Integration Steps. This Will Take Awhile.
Processing mmssetup.cab
Expanding mmssetup.cab
Processing entries.ini
Rebuilding mmssetup.cab
Rebuilding mmssetup.cab Complete.
Expanding driver.cab
```

The RVM Integrator automates the process of adding recent hotfixes to a slipstreamed WinXP installation disc.

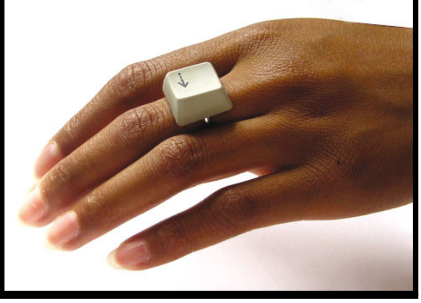
If you know how to burn a bootable slipstreamed WinXP disc, then you have all the pieces to move on to the disc-making process. The files in the \xpcd directory are now updated with SP2 and the subsequent hotfixes. If you're new to the slipstream technique, then come back next month when we walk through burning this disc with CD maker software. And, hey, the rest of you come back, too, because we'll explore the other goodies you can pack onto a customized WinXP reinstall disc. CPU

by Steve Smith

Infinite Loop

Bling-Bling For Nerds

So you found the perfect woman: She can quote "Star Wars," enjoys gaming, and can mod along with the best of them. Although all women love jewelry, yours might just be the perfect recipient for an Azerty Objects Keyboard Ring. The company creates the rings with a variety of keys, and you can order them by emailing azerty@dezzie.net. (Disclaimer: Purchase of Keyboard Ring does not make giver of said ring exempt from future jewelry purchases, including, but not limited to, actual precious stones.)



Source: xs.mohr-i.nl/~dezzie/portfolio.html

Warm Up To Penguins

Listening To MP3s In Linux

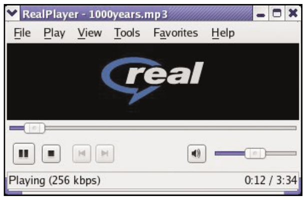
Many Linux proponents suggest that instead of using the MP3 format, you use a format such as Ogg Vorbis or FLAC, as such newer encoding technologies don't have many of the limitations that MP3 has. (See en.wikipedia.org/wiki/mp3 for a good discussion on the topic.) Still, even as some Linux users respond to complaints about handling MP3s by telling you to make a switch, many Linux users must take into account the large libraries of MP3s they've already created from their own CDs. Additionally, many Linux users listen to audio that's streamed in MP3.

If you're a Linux user who, for whatever reason, still wants or needs to use MP3s, we'll cover a few options for doing so, including using RealPlayer or a plug-in from Fluendo for GStreamer. RealPlayer is generally considered as being the first legal MP3 player that was made available to Linux users. Fluendo makes its open-source option (www.fluendo.com/resources/fluendo_mp3.php) available through an MP3 license that it purchased specifically for users to download a plug-in for GStreamer. If you're an open-source-only type of user, you'll want to at least try the Fluendo plug-in. If you don't have a particular preference, you may prefer RealPlayer.

Installing RealPlayer

You can get RealPlayer directly from the main page at Real's Web site, but we recommend going to https://player.helixcommunity.org/2005/downloads instead. At this site look to the first table near the top of the page for the Linux version of RealPlayer Gold and either click the option for RPM (for RPM-based distributions, such as Fedora, Red Hat Enterprise Linux, SuSE, or Mandriva) or Installer (for non-RPM-based distributions). You'll need the library containing the file libstdc++.so.5 installed; if you don't have the library installed, the RPM installer won't indicate that it's missing, but RealPlayer won't run properly. In Fedora Core this library is within the package compat-libstdc++-33, give or take a version number or two.

If you download the RPM version, install it using your preferred installation method. If you chose the Installer version, however, download the file and then change to the directory that you saved it to. Next, make the file an executable. For example, you might type something like **chmod u+x realplay*.bin**. You'll then run the file from within its directory by typing something like **./realplay*.bin**. This version of the installation requires the same library as we mentioned for the RPM installation, but the Installer version will inform you if this library isn't present.



One option for playing MP3 files in Linux is RealPlayer, shown here.

If you have the necessary library installed, you'll see text that explains that the installer will add RealPlayer to your system and to press ENTER. After you do so, you'll be asked if you want to create a directory to install the software to or if you want to install it to an existing directory. If you're not running the program as root, you'll have to select a location that your user account has access to. After you accept the default path or type the path you want to use, press ENTER. From here you will press F to finish installing the software or press P to back up to the other prompts. Assuming you press F and then ENTER, the installer will put the files in place.

The RPM installer should place RealPlayer in the multimedia section of your GUI's menus, but the manual installer won't. You'll need to create your own icon on your panel, Desktop, or in your menus to avoid having to type the program name (and possibly the path, such as **/home/dee/Downloads/RealPlayer/realplay**) to run RealPlayer. If you run into trouble installing the RPM or Installer versions, click the View link in the Readme column for your version. Here you'll find notes concerning issues that you may encounter.

Installing The Fluendo GStreamer Plug-in

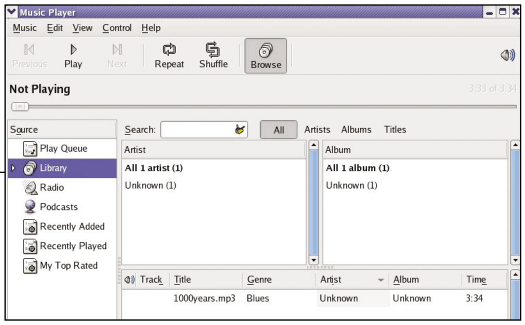
Before you begin installing this MP3 plug-in, make sure you have GStreamer installed. You can do this using your distribution's package-management tools. To download and install the Fluendo GStreamer MP3 Plug-in, go to shop.fluendo.com and select one of the three options: x86_64 without IPP (Integrated Performances Primitives) for 64-bit operating systems; i386 without IPP, if you don't want the Intel IPP optimization code; or i386 with IPP, which is the option most users with 32-bit OSes will want. Click through your selection and choose one of the distributions listed under Available Options. At the time of this writing, the only two choices were Generic and Fedora Core 4, which is a safe choice for Fedora Core 5 users, as well. Select the version you want and click Add To Cart. You'll also notice that you don't have to pay for these tools.

Click Checkout when you're ready to download. Unfortunately, you'll have to create an account at the welcome screen to continue. Assuming you don't have an account already, click Continue in the New Customer panel, fill in the account information, and click Continue. Once you create an account, a Your Account Has Been Created page appears. Click Continue and don't worry about the address information, as you won't be receiving any physical shipments. Click Continue again to reach the Order Confirmation page. Double-check that the software version(s) you want are selected, read the terms and conditions, click the user-agreement confirmation button, and click Confirm Order. In the Your Order Has Been Processed screen, consider checking the option for receiving update notifications. In the Download Your Products Here section, click the version name (such as i386 with IPP) to open the download dialog box. If you chose the Fedora Core 4 RPM, continue to install the RPM using your preferred method.

If you choose the Generic option, you'll end up with a tarball that ends with a .TAR.GZ extension. From a command prompt, change to the directory that contains the download and unpack the tarball. For example, you might type something like **tar zxvf gst-fluendo-mp3*gz**. Change to the directory that's created during unpacking (you'll type something like **cd gst-fluendo*i386** to do this) and then check the contents of the Install file with your preferred text-viewing tool. If the instructions in the file are different from those we're presenting here, follow the instructions listed in the Install file.

Next, type **ls ~/.gstreamer*** to see if you already have a .gstreamer directory in your home directory. You may see more than one version listed, such as:

```
/home/dee/.gstreamer-0.10:
registry.i386.xml
/home/dee/.gstreamer-0.8:
registry-i686.xml
```



Here the Rhythmbox player is playing an MP3 file in Linux via the Fluendo license and GStreamer plug-in.

If you see more than one version, only worry about the most recent one (.10 in this example). If there's already a plug-ins subdirectory present, skip the next step. If there isn't one, you'll need to create one. The command **mkdir -p ~/.gstreamer-0.10/plugins** will create the subdirectory. Next, copy the plug-in file from the directory you unpacked it to into the .gstreamer plug-ins directory. For example, you might type **cp libgst* ~/.gstreamer-0.10/plugins**.

No matter which way you install the plug-in, you can test it by typing **gst-inspect-0.10 flump3dec | more** (keeping in the mind the version of gstreamer you're using). If the plug-in is properly installed, you should see such information as:

Factory Details:

Long name:	Fluendo MP3 Decoder
Class:	Audio/Decoder
Description:	Decodes MPEG-1 Layer 1, 2 and 3 streams to raw audio frames
Author(s):	Fluendo Support <support@fluendo.com>
Rank:	primary (256)

You should now be able to listen to MP3s legally in any gstreamer-based music player, such as Rhythmbox.

Let The Music Play

Until the patent that's attached to the MP3 format expires in 2010, Linux users in countries that allow software patents will have to continue using one or both of these methods to legally listen to MP3s. Recent discussions among Linux vendors have focused on letting customers play all popular multimedia formats, suggesting that vendors are looking into solutions that make supporting various closed multimedia formats less cumbersome. Given that paid licenses are often involved in such ventures, unless there's another Fluendo-style license paid for an open-source version, it's likely that full multimedia support will remain relegated to illegal options for the free distributions or purchasing commercial solutions that have done the necessary legwork.

by Dee-Ann LeBlanc

Infinite Loop

Happy Little Clouds

Who can forget the now-deceased Bob Ross, the soft-spoken oil painter with the big afro who taught us how to create our own "happy little worlds" on his PBS show, "The Joy of Painting"? Even though he's gone, you'll soon be able to become a Bob Ross apprentice via a Bob Ross painting game that AGFRAG Entertainment Group is developing for the PC and Nintendo's DS and next-gen Wii console. The game will be aimed at players of all ages, offering various activities to develop creative skills. And remember, there are no mistakes in Bob Ross' world, only "happy accidents."

Source: www.bobross.com/news.cfm

Shavings From The Rumour Mill

PC Churn Means We All Will Upgrade

by Mike Magee

Now I really am stuck on the horns of a dilemma, and that mooing I hear is surely a sign that choosing where I want to go tomorrow will be a cow of a decision. I've no doubt you're thinking, "It's about time you got your comeuppance, Magee." But there is a distinct possibility that I may have the last laugh, and as everyone knows he who laughs last laughs longest.

Why the bother? Well, according to Microsoft we're only a few months away from the introduction of Vista, and I just can't figure out what kind of machine I will need to get the most out of the operating system. It's a taken that there will be some sort of dual-core chip running my operating system because by the end of this year it will be hardly possible to buy a PC without one.

I've just interviewed the CEO of ATI, Dave Orton, and he is far too level-headed a guy to dive into hyping up operating systems, but even he seems excited about the graphics we might get when DirectX 10 and a Microsoft OS synch together. Let's face it: Mr. Orton is biased. He knows that the future survival of ATI's and everyone else's business depends on churn, or the ability that we have to upgrade our machines and our PCs every other year.

But how do I know which version of Vista will be optimised for which dual-core chip? Microsoft, Intel, and AMD are giving precious little clues about where I want to go tomorrow. I've just seen an AMD announcement that its X2 Turion machine will be specially optimised for Windows Vista when it arrives, but I do not know what that means. Has Microsoft so comprehensively written or rewritten the operating system that if I have a 64-bit CPU things will whizz around much faster than they're currently whizzing around on XP and a good old 32-bit chip? On this Microsoft—and, for that matter, Intel and AMD—are too silent for my liking.

What sort of optimising do AMD dual-core chips have, and will there be a different optimisation for Intel dual-core Merom and Conroe processors?

You will excuse my cynicism on this, but it's all very well having two, four, or eight cores on a microprocessor on the principle that more is better. But is more really better here? The song and dance that Intel made about Hyper-Threading is now a thing of the past. We all wanted to know whether application software, even boring application software like Office, would take advantage of Hyper-Threading. We were assured by Intel that was the case, but we are still not entirely certain what benefits Hyper-Threading bestowed on operating systems, on application software, and on the other useful things we like to play with.

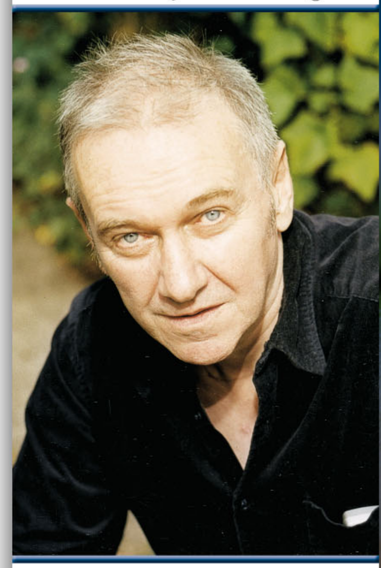
We didn't notice any great performance boost with our last desktop machine, even given the fact it had a 6XX Intel chip, 1GB of memory, a super graphics card, and a fast hard drive. In some ways, tapping away as we have done about PCs for the last 20 years, we haven't noticed any big difference in our typing speed since the days we used WordStar on an 8MHz zero-wait-state 286.

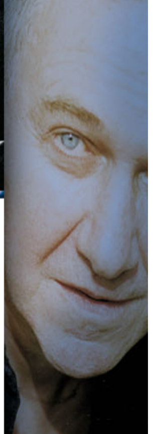
Eight megahertz!

Don't get me wrong, all this technology is really super-duper; I've seen and been to the fabs, and the sheer brainpower exhibited in the act of making a CPU, including the machinery and the tools, is *staggering*. But what's the greatest thing that's happened to our technological lives in the last 10 years? It's not increasing CPU clock speeds, and it's not the different iterations of Windows—it's broadband Internet access.

Computer manufacturers and chipmakers have often likened their machines to automobiles, a dangerous metaphor. There was a time, many years ago, when people cared about what spark plug made the engine tick, or which brake pads were used to bring your vehicle to a stop. These days we know that our automobiles are stuffed full of semiconductors. But does anyone care who makes those chips, apart from the semiconductor and the auto manufacturers themselves? ▲

Send rumours to "Mad Mike" Magee at Mike@cpumag.com.





Mike Magee is an industry veteran. He cut his teeth on ancient products like the Dragon and the Japanese PC platforms long before the IBM-PC won. He worked for a corporate reseller in the mid-'80s and saw the Compaq 386 sandwich box and every GUI known to humankind. Mike decided that the way to go was the Interweb around 1994 after editing PC mags in the late '80s and '90s. A co-founder of The Register, Mike started the chip-driven INQUIRER (www.theinquirer.net) in 2001. He has contacts from top to bottom in the business, spanning the entire chain, who help him root out interesting rumours and speculation.

> . . . how do I know which version of Vista will be optimised for which dual-core chip?

Guest Column
by Rahul Sood

Centrino: Intel's Israeli Savior

A number of years ago, Intel realized that its Pentium 4M notebook architecture was about to hit a ceiling that no amount of marketing could break through. The Pentium 4M mobile CPU would max out at 2.6GHz and carry with it high thermal and power requirements. Months prior to the launch of the Pentium 4M 2.6GHz, Intel knew it had to make some changes in its platform in order to create fantastic thin-and-light notebook designs.

The best strategic move Intel has ever made was taking on a team of rogue engineers from Israel who had designed its next-generation notebook technology. Believe it or not, it was probably one of the best moves for our entire industry, as well.

Intel's team in Israel is by far one of the most talented and focused groups of engineers on the planet. Stressing platform performance over gigahertz, Team Israel combined a low-voltage processor, a flexible wireless card, and a high-performance motherboard chipset, and Intel Centrino was born. Centrino was the total package, delivering unbeatable performance, excellent battery life, and a great wireless experience.

Back then Voodoo and companies like it were telling Intel that its Pentium M chips had surpassed the Pentium 4 and advising the chipmaker to follow a similar path for the desktop, server, and workstation. But for whatever reason, Intel steadfastly continued creating higher-power, louder, and less efficient designs for everything but notebooks. As a result, Intel was effectively sending mixed messages; while one arm was saying, "clock speeds mean nothing," the rest of the body was saying, "clock speeds mean everything." This spelled the beginning of some serious trouble for Intel.

One of the worst moves Intel made during this period was electing not to design its entire portfolio in Israel. Alternatively, one of the best moves Voodoo made was putting Pentium Ms in its desktops, even though Intel frowned on the practice.

By contrast, AMD had already been championing performance over GHz for a long time, and instead of breaking its products into two distinct categories it focused on power throughout its portfolio. It took years for AMD to crack the mainstream perception of the importance of clock speeds, but in the long run Intel itself helped unravel this myth as people began to see the disparity between Pentium M and Pentium 4 clock speeds and their relationship to performance.

Today AMD continues to eat away market share based on the momentum that it has gained over the years. One could say that AMD managed to legitimize itself to the mainstream with the help from its loyal customers. AMD has won the battle that it always wanted to win; it wanted to crack into Dell and other OEMs who are currently Intel-exclusive. There will certainly be more surprise announcements this year—no doubt in my mind.

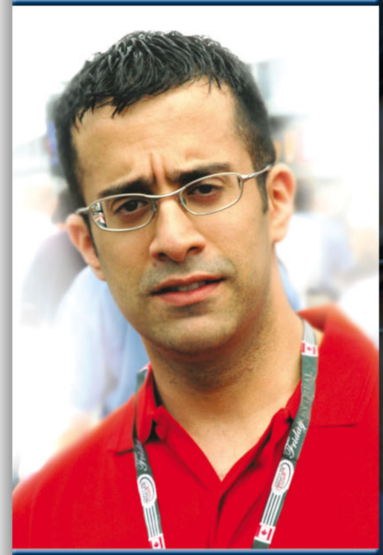
Intel, of course, now realizes the importance of its Israeli design team. If not for Centrino, Intel would be in a much worse, very dire position. Intel is now focusing resources on that team and repositioning much of its R&D to Israel. Team Israel is essentially carrying Intel on its collective back and is more than up to the task.

I recently had a chance to test Intel's next-generation Conroe CPU in our labs, and I must tell you I'm very impressed with it. You can't argue with the benchmarks; this thing is very damned fast. Intel's platform performance is absolutely stellar, and it puts the company back on the rails and back in competition with AMD.

This year Intel will release new notebook, workstation, and server processors with 64-bit, dual-core technology. It will also launch Conroe for the desktop, and I can report without hesitation that it's everything Intel claims it is—I just hope the company can produce enough of them to satisfy demand.

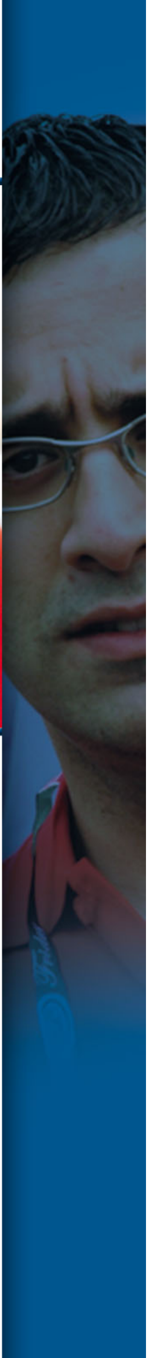
Is Intel's comeback going to kill AMD? No, but the company is certainly regrouping to go back to war, and this time it isn't armed with squirt guns. ▲

Send comments to Rahul@cpumag.com.



Rahul Sood's love for computers started at the young age of 11. Much to the shock and dismay of his parents, he ripped apart his brand-new Apple //c and painted it red before turning it on. His parent's dreams of having a doctor for a son were shattered when college drop-out Rahul founded what is now one of the most respected high-end computer companies in the world, Voodoo Computers.

. . . it was probably one of the best moves for our entire industry . . .



Technically Speaking

An Interview With Chris Crawford, Author & Gaming Pioneer

Chris Crawford created and sold his first computer game in 1978. He followed that up with 13 more, including several innovative titles and bestsellers such as Excalibur and Balance of Power. (A new version of Balance of Power was issued in 1990, and Crawford says he's planning a third, heavily updated version for release sometime in the next few years.) Along the way, Crawford has developed games for Atari, published seven books, and helped found The Game Developers Conference. He is now working on authoring tools for an online interactive storytelling project called Storytron (www.storytron.com).

by Barry Brenesal

CPU: Your games emphasized character interaction, in comparison with many other titles released then or since. Frequently, players only got what they wanted by making deals, and there were always trade-offs in how others viewed you. A good example of this was Excalibur.

Crawford: Excalibur was certainly one of the most ambitious game designs attempted during that period. By the standards of the day, it was a real leap into the wild blue. Conquering England happened automatically if you had the full support of all the knights. But the real challenge was keeping their support because everything was designed for them to be a fractious lot who would cluster and group and take sides. They'd walk away from you if they didn't like the promotions you gave out.

CPU: Why do so few games let players play in this open-ended, value system-derived fashion?

Crawford: I have read a study that the rate of autism in children born in the Silicon Valley area is unusually high. The speculation is that, basically, technical people are all slightly autistic, and when you concentrate them, they start breeding among themselves, which gives you more autism in the population level. I think there's some truth to that in a very vague, almost metaphorical sense. Certainly game programmers are not very sociable people, and games seem to attract the least social of males. So what you end up with are games that just aren't about *people*, about social interactions. They're about objects. When they do put people in the games, they're completely mechanical. They reflect the world view that sees human beings as simple machines. And that's really the theme I've been hammering away at for decades. It's also one reason why women seem to be less interested in games because they're more interested in social interaction than men.

CPU: Some research would have us believe that men and women play games in roughly equal numbers. Are there fewer women playing games than men?

Crawford: Oh, yes. What happens is that the game industry does a study and basically they fudge the results to get what they want, to make it look as if normal, everyday people play games just as much as kids do. The way I caricature it is as a television commercial that game publishers would love to do if they could: 'Hello, I'm Sister Mary Magdalene. After a long day of glorifying God through good works, I like to kick back and blast some monsters. I hold the high score for my convent!' This is nonsense.

There are millions of adults that play games, but they play crossword puzzles. My wife likes to play Sudoku, but that doesn't make her a 'gamer.' Or if it does, then the definition of gamer becomes so broad as to be useless. If you want to sit down and ask the real question, 'How many people play the kinds of games that are mainstream to the games community?' it's mainly millions of male teenagers. For a target market, the game publishers know exactly who they're aiming for; they don't have commercials on 'Meet The Press.' They put their commercials for games on Saturday morning cartoon shows. These are very consistent with the kind of entertainment that the target market enjoys.

CPU: Are there any games within the mainstream genres—role playing, strategy titles, etc.—that buck the conformist trend?

Crawford: I'd have to say that the reverse is true. That is, we had a much greater variety of games in the 80s than we have today, and I've seen a steady decline over time in their heterogeneity. Not just at the commercial level, either, but also at the level of what are called indie games—that is, games that are done by people who are just trying to build a game for love, not money. It's actually quite surprising to me. Part of the problem here is that a lot of people don't remember what the games were like in the 80s. The indies are simply doing stuff based on what they've seen out there, and the commercial world is so homogeneous that they have nothing to inspire them beyond that. We are certainly not seeing the type of design in which somebody goes off into the wild blue yonder and does something completely different.

The peak of innovation was from about '83 to '89. There were a lot of screwball ideas back then, and a lot of them stank. Which is fine because it's all part of the whole creative process: You go out and take chances and you fail most of the time. But in addition to the successes, there were some very impressive failures back then. Whereas what I'm seeing nowadays, even at the indie level, is just very derivative.

I wouldn't say that we're seeing a decline in quality. There's a lot of artistry in the quality of the graphics, the animation, and that's gone way up over time. But when you create art, you set out an idea that you want to communicate. Then you design in your medium to communicate that idea. That never ever happens in the game business. The great majority of designs are simply: Let's take last year's game and do it one better. Nobody is going back to basics and asking, 'How can we design a game that presents the player with interactions that illustrate a given idea?' Will Wright [SimCity, The Sims] has an artistic sensibility. He wants to produce games that are great toys to play with, so he creates these wonderfully complex systems that you can play all day long. But they're not motivated by some particularly designed goal.

CPU: In your 1984 book, 'The Art of Computer Game Design: Reflections of a Master Game Designer,' you wrote, 'Thus, technological immaturity, the weakness of current 8-bit, 64K, 1MHz systems . . . is a crippling limitation. Yet . . . artistic immaturity is an even more crippling limitation.'

Crawford: That turned out to be right.

CPU: Is the artistic immaturity part of the male-dominated game programmers' community constantly feeding off itself, or is it brought in from the outside, as the industry turned game design into a machine?

Crawford: Good question. Certainly, in the very early days, there were designers who had pretty highfalutin ambitions. There were people out there like Dan Bunten [M.U.L.E., Cartels & Cutthroats, and Global Conquest] trying to use the medium for some kind of interesting result. The problem was that the medium back then was so difficult to use, therefore these people didn't really stand out. By 1985, though, the industry had established itself so firmly that it was increasingly hard to attempt original designs. By 1990, originality had been shut out.

CPU: At your Web site (www.storytron.com) you discuss three main approaches to storytelling technology.

Crawford: Well, the branching narrative is a story that is basically defined as a tree. The player is allowed to make decisions at various branches. This approach just doesn't work. It has been tried hundreds, if not thousands, of times, and the problem is you simply cannot build a tree that's big enough to be interesting. The narrative game is an attempt to graft a narrative onto a game. Typically, the narrative aspect ends up being a digression. It's supposed to provide some back story or dramatic context, but in practice there's never any true unification between the two parts. The narrative remains bolted onto everything else. Origin Systems' Wing Commander series was among the first to do this. What made that successful was the huge budget they put into the graphics; they were buying market share with each successive title. They in effect forced other game companies to enter bidding wars. But the economics didn't work, and they actually lost money on every one of these games when it was new. It was only in the expansion packs that they were able to turn a profit. Narrative wasn't among its virtues.

CPU: How does Storytronics differ from those two approaches?

Crawford: In Storytronics the story *is* the game. It is more open-ended and based on character interaction. There is no plot.

CPU: Are the characters in these environments code-controlled or human?

Crawford: They're controlled by algorithms. All the mechanical algorithms I program. The dramatic algorithms are controlled by an artist we call the story-builder. Our idea is to build a whole development environment and recruit lots of storybuilders to build lots of storyworlds. CPU

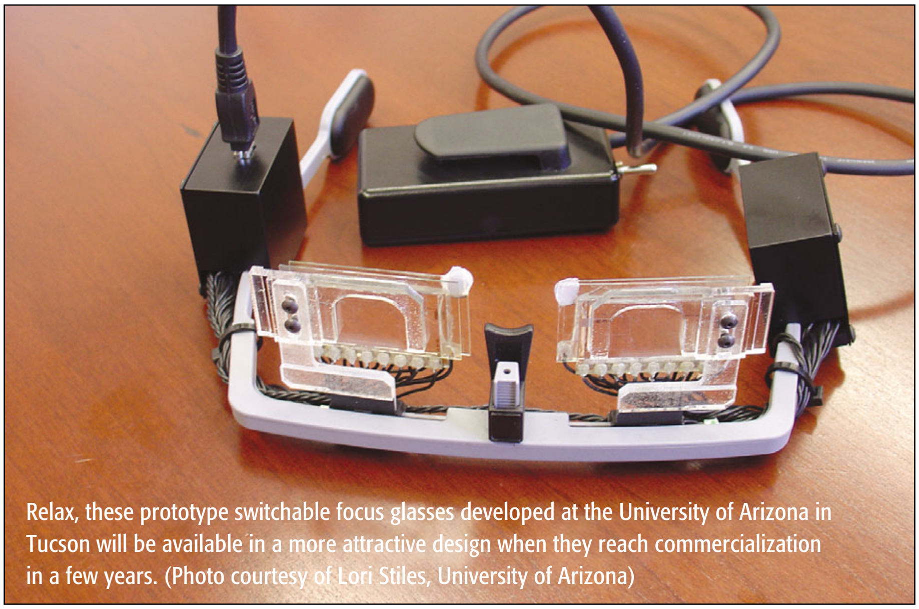
That is, we had a much greater variety of games in the '80s than we have today. . . . —Chris Crawford

CPU ONLINE Subscribers can read bonus content with Chris Crawford at www.cpumag.com/cpujul06/crawford by Kristina Spencer

Under Development

A Peek At What's Brewing In The Laboratory

Jeepers Creepers, Hi-Tech Peepers



Relax, these prototype switchable focus glasses developed at the University of Arizona in Tucson will be available in a more attractive design when they reach commercialization in a few years. (Photo courtesy of Lori Stiles, University of Arizona)

Presbyopia. No, it's not the latest wonder drug advertised incessantly during televised sporting events; it's the common age-related condition of being able to see far-off objects in focus while those right in front of your face look like a scene from Van Gogh's "Starry Night." Even if you're currently among the unbespectacled, the fact that a reported 95% of those over the age of 45 have some degree of presbyopia means you have an excellent chance of joining the 40 million Americans who reportedly wear bifocals to correct this vision loss.

If you're not keen on wearing your grandfather's eyeglasses and experiencing the eyestrain and head-bobbing that often accompany them, you are in luck. Researchers at Arizona State University have developed prototype "smart glasses" that change their focus when a wearer flips the switch on a small attached battery pack, instantly providing corrected vision without having to look through the lines.

Each lens has two flat panes of glass with a 5 micron-thick layer of liquid crystal between them. When transparent electrodes attached to one of the glass layers apply electricity, the liquid crystal shifts, changing the way light moves through it and bringing objects up close into clear focus. Flip the switch again, and the glass becomes transparent, allowing the wearer to see things at a distance.

The prototype goggles are bulky and not exactly the height of fashion, but Nasser Peyghambarian, professor and lead researcher on the project, believes that within two to three years, attractive designer specs with dynamic lenses will be available at $200 to $500 a pair.

The next step in the project is replacing the manual switch with a system that can monitor where the wearer's eyes are focusing and automatically adjust the glasses to the correct prescription. The technology behind this next generation of the dynamic glasses is "based on a range-finding mechanism, similar to the way auto-focus cameras operate," explains Peyghambarian. "Infrared light is sent from the glass to the object, and the return signal determines the distance of the object to the lens and would allow adjusting to the right focus." ▲

Hardworking Viruses Construct Batteries

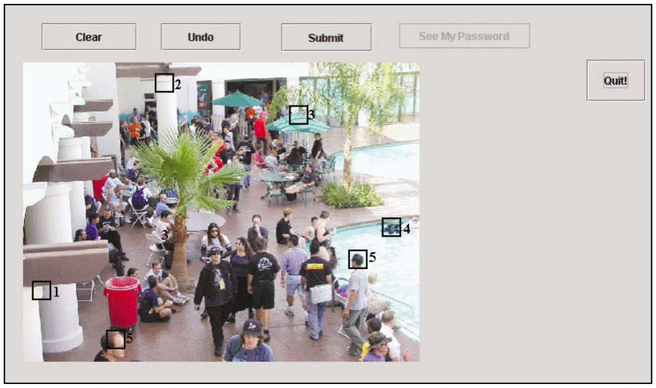
Human and computer viruses often get a bad rap. From the common cold to those that email themselves to everyone in your address book and wipe out your hard drive, viruses are generally nuisances (or worse) you try to avoid. MIT scientists, though, have found a use for one strain.

A research team that professors Angela Belcher, Paula Hammond, and Yet-Ming Chaing are leading has genetically engineered M13 viruses to organize themselves into tiny nanowire structures that form the positive electrode in functional ultra-thin lithium-ion batteries. To assemble the electrodes, they first altered the virus' DNA so that their protein coats would bind to molecules of cobalt oxide and gold. Next, they dipped a polymer electrolyte into a solution containing the viruses that coated the polymer uniformly. Finally, they dipped the virus-laden polymer in a solution containing the cobalt oxide and gold. The viruses collected and assembled the molecules into positively charged thin wires, 6nm in diameter and 880nm long (each virus' length).

Paired with a conventional negative electrode, the virus-assembled anode created a battery that not only was very thin but also energy dense, due to the high-specific capacities of the metals. "The nanoscale materials we've made supply two to three times the electrical energy for their mass or volume compared to previous materials," the team reported in an MIT press release.

Because the altered virus can reproduce quickly and the assembly process can take place at normal temps and pressures, the technology holds great promise for low-cost manufacturing of high-capacity, ultra-small batteries that could power anything from cell phones to tiny robots. Chiang thinks in a few years small batteries ranging in size from a grain of rice to hearing aid-sized batteries could be made for specific apps using this process. The researchers hope to make viruses that create the negative electrode as well, leading to self-assembled batteries. ▲

Authentication At The Click Of A Mouse



We all know the rules for creating a secure password: It should be seemingly random; have a blend of letters, numbers, and cases; be changed frequently; and not used more than once. But human nature and memory being what they are, we break the rules all the time by creating passwords that we can remember easily, reusing them on different accounts, and sometimes even writing them down. This so-called "password problem" is what makes your sysadmin so cranky.

As one possible solution, a team of researchers that Jean-Camille Birget, professor of computer science at Rutgers University-Camden, is leading has developed a graphical password system that replaces the traditional login screen with an image. Rather than type a password, users authenticate via a series of five or more mouse clicks at user-selected "click points."

The image is mapped to an underlying system of three grids that allow the user to click within a confined range around the original point rather than demanding unrealistic pixel-level precision. A user can choose any image, as long as it is complex enough to contain a large number of possible click points so that the system is secure.

The team has also designed a system to keep a user's password safe from "shoulder surfing." A user chooses 10 icons that are scrambled with 200 others. She then picks shapes that use her chosen icons at the corners and click inside the shapes. Because she never clicks directly on her chosen icon, anyone watching would be unable to detect a pattern.

The question is will users be willing to make the leap from tried-and-true typing to point-and-click authentication? Birget hopes so, but he isn't entirely certain. One potential drawback of living in a fast-paced technical world is that graphical passwords take slightly longer to enter. Birget says, "People are unfamiliar, and hence less skillful, with graphical password systems, and it remains a question how skillful people will become after long-term usage."

Birget plans to begin work soon on readying the graphical password system for the commerical market by developing a commercial-quality implementation. From a technical point of view, he thinks a product could be ready within six months, although getting it to market will take additional time. ▲

Where Laser Meets Silicon

When it comes to making transistors, the name of the game is smaller, faster, and more efficient. To that end, a three-year European research study group called the FLASH project has developed a 70nm CMOS manufacturing process that promises to do all three.

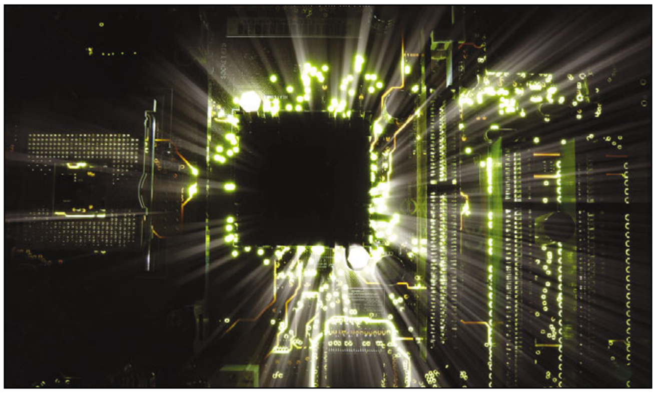
The process, known as ELA (excimer laser annealing), uses a laser (instead of lamp-based systems now used) to heat silicon above its melting point in nanoseconds. When dopant atoms are added to the melted silicon, they diffuse through it evenly, stopping precisely at the melt depth. This level of control in the process allows for the creation of more efficient transistors that require less energy to run.

"The main advantages of using ELA are represented by the possibility of achieving ultra-shallow junctions whose depth is fixed by the laser fluence—extremely abrupt and with huge electrical activation. These peculiarities cannot be obtained at this level with conventional thermal treatments," says Dr. Vittorio Privitera, CNR-IMM senior researcher and FLASH coordinator.

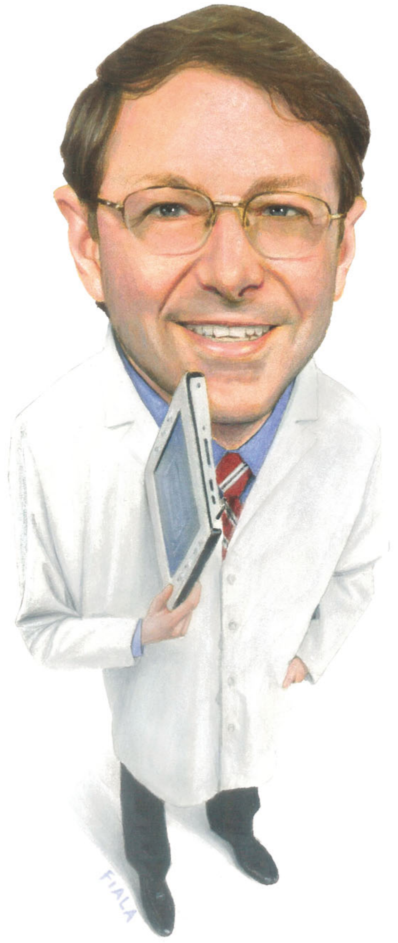
The team also successfully used mirrors to protect parts of the CMOS device that contact with the laser could have damaged. The team also developed 2D software that simulated the laser's effects to demonstrate that the silicon was only altered in very precise, controlled ways.

Although the project concluded in December 2005, there's still work to do before chips can be mass produced via ELA. Privitera and the team continue work on the prototype and are awaiting approval of two patents on the materials and process. Privitera is pleased with the project's results and is optimistic that the project can overcome any remaining technical hurdles.

"The FLASH project [went] in three years from a pure feasibility study to device integration, fabrication of device wafers with 90% yield, and working packaged transistors. A period of five years, with funded research in excellence centers on these topics, might be a sufficient time to achieve mass production of CMOS," he says. ▲



Q&A With Rick Rashid



Rick Rashid's official title is senior vice president of Microsoft Research, but he's essentially an ambassador for Microsoft. As senior vice president of Microsoft Research, he is responsible for managing the company's research efforts and collaborating with partner companies and universities. Rashid joined Microsoft in 1991 and has served as head of research since 1994. Before taking on his research management role, Rashid was an accomplished researcher in his own right: He was a computer science professor at Carnegie Mellon University and published dozens of papers on computer vision, programming languages for distributed processing, operating systems, and a variety of other topics.

Today Rashid is in charge of an organization with more than 700 researchers working on 55 research topics. The research group includes major facilities in Redmond, Wash.; Beijing; Cambridge, England; Bangalore, India; and Mountain View, Calif. The areas of study include speech recognition, information retrieval, user interface research, programming tools and methodologies, operating systems and networking, graphics, natural language processing, machine learning, and mathematical sciences.

Q **Some folks are saying that the focus of innovation in computing is moving beyond the PC.**

RR I don't think that's true. There is a different way of saying that. There was a time when almost all of technology was the PC. What has happened is that computing is coming to permeate almost everything. How many devices do you have that don't compute? Your car increasingly has computation through navigation and the control systems in the car. Basically you can't fix a car anymore without doing computer diagnostics. We are getting software from so many different kinds of devices. I don't think the PC has been lessened; I think the ecosystem has expanded. It's no longer just focused on the PC. The value of the PC is that all these devices tie back to the computer.

Q **As Microsoft's research labs grow and all of the other newer corporate labs grow, does that make up for the shortfalls in federal funding for basic research?**

RR We will see how things go. President Bush in the State of the Union address announced a new initiative for funding basic science. He talked about doubling the budget of the National Science Foundation, the National Institute of Standards and Technology, and Department of Energy over 10 years. A lot has to happen in terms of actual appropriations. This is just a proposal at this point; it is not legislation. But if that happens, I think that will go a long way to put us back on the track we were on.

Q **There is a lot of open-source research going on these days. How do you compete with that?**

RR People in the academic community always try to leverage each other. We publish a lot of literature. We share our research with other researchers. We are certainly part of that process. Just in Redmond alone this summer we will have more than 200 Ph.D. interns. The United States only produces about 1,000 Ph.D.s a year in computer science. We bring a large fraction of that in. We do a lot of work with universities and publish joint research. We share the ideas. We are very open in the way we work.

Q **If you think of the money spent for research as finite, how do you decide which areas to allocate the most money?**

RR I don't even go to that middle process. We don't do that. The way we decide on research we are doing is to decide on the people we hire. The people decide the research. We try to hire the best people we can. We don't have budgets for the research process. We hire good people. We expect them to take personal responsibility and do good research.

Q **You have poured a lot of energy into portable things over years.**

RR It's certainly true that our research has been used. A lot of things you think of as Microsoft today came out of Microsoft Research. All the original graphics came from the research team. The digital media team came out of research. The Tablet PC came out of research. That's part of technology transfer.

Subscribers can go to www.cpumag.com/cpujul06/rashid for bonus content.

READY TO BOOST
YOUR SLI ENGINE

NVIDIA
SLI™
READY

Supercharge your gaming experience
with NVIDIA SLI technology PSU
by ENERMAX

Liberty
400w/500w/620w

ATX12V Ver 2.2 / DUAL +12V / DUAL CORE READY / MODULAR

ENERMAX
WWW.ENERMAXUSA.COM

Maxpoint Computer Inc.
1733 Rowland Street
City of Industry, CA 91748
(626) 913-8899
www.maxpoint.com

Coolergiant Computer Inc.
2955 Whipple Road
Union City, CA 94587
(510) 324-0688
www.coolergiant.com

PC POWER & COOLING, INC.®

21 YEARS OF INNOVATION

Quad SLI Power!

Introducing the Turbo-Cool® 1KW-Quad SLI, the First NVIDIA-Certified Unit for Quad SLI Graphics

MORE

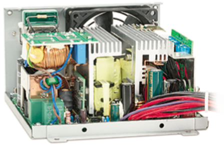
ECONOMICAL, ULTRA-QUIET POWER SUPPLIES

- Silencer 310 ATX
- Silencer 360 ATX
- Silencer 470 ATX

+12V@19A-26A
90% Less Noise
.99 Active PFC
Only $49 – $99

HIGH-PERFORMANCE POWER SUPPLIES

- Turbo-Cool 3001U
- Turbo-Cool 4001U
- Turbo-Cool 510 ATX
- Turbo-Cool 510 Deluxe
- Turbo-Cool 510 Express/SLI



See the Difference

DELL UPGRADE POWER SUPPLIES

- Silencer 360 Dell
- Silencer 410 Dell-1
- Silencer 410 Dell-2
- Silencer 470 Dell

Allows Dell Video Upgrades!

ACCESSORIES

- ATX Power Supply Accessories
- Other PSU Accessories
- Silencer Cooling Fans
- Other Cooling Accessories

MAXIMUM-PERFORMANCE POWER SUPPLIES

- Turbo-Cool 510 AG (server/workstation)
- Turbo-Cool 510 XE (server/workstation)
- Turbo-Cool 510 ASL (graphic workstation)
- Turbo-Cool 850 SSI (next-gen power)
- Turbo-Cool 1KW (max server power)
- Turbo-Cool 1KW-Quad (max graphics power)

Ultimate Power!

1 Kilowatt Continuous

5 YR WARRANTY

WHAT'S NEW

- 1KW-Quad SLI
  Now Shipping!
- Certification
  Explained!
- Turbo-Cool 1KW
  Now in Stores!
- CEO Interviews
  Radio and Print!

Which Power Supply Is Recommended For Your System?

CLICK HERE

POWER SUPPLY MYTHS EXPOSED!

CLICK HERE

TECHNOLOGY

- Power Usage Table
- Power Supply Terminology
- Troubleshooting Guide
- Temperature vs Reliability
- ATX12V Specifications

Each 1KW comes with its own individual, 16-point test report generated by our Chroma 8000 ATE.

www.pcpower.com • PC Power & Cooling, Inc., 5995 Avenida Encinas, Carlsbad, CA 92008 USA • 760-931-5700 • 800-722-6555

Turbo-Cool, Silencer and PC Power & Cooling are registered trademarks of PC Power & Cooling, Inc. NVIDIA and SLI are trademarks of NVIDIA Corporation. © 2006.